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Series V Volume V Nº 1 March 1983

Published Since 1793

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The Concept of Climate and National Superiority in the Talmud and its Classical Parallels*

STEPHEN NEWMYER

NATIONALISM, with the xenophobia that frequently attends it, left an indelible impression on the thinking of ancient nations. Nowhere does it appear more conspicuously than in ancient writings on environmental medicine and climate. These aspects do not seem to be participating in the renascence of interest which the less theoretical and more technical areas of ancient medicine have enjoyed in recent years. The reason for this difference is not far to seek. The Hippocratic treatise *Airs, Waters, Places*, the earliest and most extensive treatment of climate in ancient scientific literature, advances, in the context of scientific medical inquiry, the notion that the climate of Europe is superior to that of Asia and hence the character of Europeans is superior to that of Asians. The treatise draws a sharp dichotomy between the two continents. This is typical of the Greek tendency to think in polar opposites,[1] and it introduces into medical literature an element of racial snobbery which was to become usual in ancient discussions of climate. In the present essay the belief that national cultural superiority is to a significant degree attributable to national climatic superiority is traced from its classical statement in the Hippocratic treatise, through its Roman refashioning, to its late flowering in the Talmud. Although Greco-Roman formulations of this idea have been examined in some

1. G.E.R. Lloyd, in *Polarity and Analogy: Two Types of Argumentation in Early Greek Thought* (Cambridge: Cambridge University Press, 1966), has given a detailed discussion of polar thinking among the Greeks, and he has noted the prominence of this type of reasoning in the Hippocratic Corpus, particularly in the Hippocratic fondness for attributing disease to dominance of one polarity over another, as, for example, hot over cold or dry over wet. He notes that, conversely, cures are often said in the Corpus to be effected by counterbalancing an excess of the opposite pole. It is surprising, however, that Lloyd mentions *Airs, Waters, Places* only once (p. 22, note 2, with regard to its analysis of seasonal conditions in terms of opposites), since the argument in the treatise is heavily imbued with the sort of reasoning that is the subject of Lloyd's book. Difference in character attributable to difference in climate is not discussed.

*This paper was delivered in an earlier form at the meeting of the Society for Ancient Medicine in San Francisco, December, 1981.

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detail in numerous studies, the Talmudic contribution to the subject has escaped the attention of scholars.[2]

In *A History of Science*, George Sarton has characterized *Airs, Waters, Places* as ". . . one of the most astonishing fruits of the Hippocratic (or call it the Greek) genius. It is the first treatise in world literature on medical climatology. . . and it is also the first treatise on anthropology."[3] In praising the pioneering nature of the treatise, Sarton incidentally isolates the logical weakness of its argument whereby science and theoretical anthropology are treated as one and the same phenomenon. The Hippocratic author distinguishes climate as the cause of what he considers a remarkable difference between the character of Europeans and that of the Asian barbarians. The first eleven chapters discuss the effects of climate and locale upon health, while the final thirteen consider the influence of climate on character. In its opening statement, "Now I intend to compare Asia and Europe, and to show how they differ in every respect. . . . ,"[4] Chapter XII lays the groundwork for the philosophical assumption that underlies the second half of the treatise. After granting that Asia is extraordinarily fruitful because of its uniformly temperate climate, the author in Chapter XVI attributes to Asians a lack of courage and spirit; this he considers the inevitable consequence of residence in a climate deficient in variation, a phenom-

2. A classic discussion of the influence of *Airs, Waters, Places* on Western thinking is offered in Clarence J. Glacken, *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (Berkeley: University of California Press, 1967). Glacken gives great attention to Greek and Roman sources but does not mention Talmudic material. Of more recent date, Edwin Burton Levine, *Hippocrates* (New York: Twayne, 1971) offers in his chapter "Enviromental Medicine and the Laosphere," pp. 128–150, an enlightening treatment of *Airs, Waters, Places* without, however, covering in any detail its influence on later thinking. J. Donald Hughes, *Ecology in Ancient Civilizations* (Albuquerque: University of New Mexico Press, 1975) includes a short chapter on "Ancient Israel and the Natural Environment," pp. 43–47, but Hughes's comments are restricted to the biblical material and concern primarily the biblical view of man's place in and responsibility toward God's natural world.

3. George Sarton, *A History of Science: Ancient Science through the Golden Age of Greece* (Cambridge: Harvard University Press, 1952), p. 368.

4. All translations from *Airs, Waters, Places* are taken from *Hippocrates*, with an English translation by W.H.S. Jones (Cambridge: Harvard University Press, 1923, reissued 1962). *Airs, Waters, Places* is contained in the first volume of Jones's edition.

enon characteristic of Asia but not of Europe.[5] In Chapter XIX the Scythians, whose unvaryingly cold climate is contrasted with that of the Asians, are nevertheless held to resemble them in lacking mental energy, and this deficiency is due to lack of climatic variation. Further, in Chapter XXIII the ancient author asserts that the changeable climate of Europe renders Europeans more courageous, more warlike, and better able to bear hardship. In his opinion, the ideal climate is one of variation, without extended periods of extreme heat or cold—in other words, the sort of climate which Europe (and he may well mean Greece in particular) fortunately enjoys.

On the assumption of European racial superiority which colors the thinking of the Hippocratic author, Edwin Burton Levine has remarked justly,". . . Much of it, good or bad, has become the currency of the vulgar, commonplace and pseudo-scientific, anthropological, and a rich vein of injurious prejudice. Nowhere else, not even in Herodotus . . . , is the East-West thought axis more sharply defined in Greek or Latin literature."[6] Writing at a time roughly contemporaneous with the composition of *Airs, Waters, Places*, Herodotus, with less pretense to scientific objectivity than the medical writer claims, mirrors the Hippocratic position to a remarkable extent in the ethnographic sections of his *Histories*. The assumption with which Herodotus repeatedly begins his considerations of non-Greek nations is the degree to which the mores of a given nation differ from Greek modes of behavior; he more than once isolates the climate of a given nation as contributing to its peculiar character. The Egyptians, for example, are said (II. 35) to differ

5. περὶ δὲ τῆς ἀθυμίης τῶν ἀνθρώπων καὶ τῆς ἀνανδρείης, ὅτι ἀπολεμώτεροί εἰσι τῶν Εὐρωπαίων οἱ Ἀσιηνοὶ καὶ ἡμερώτεροι τὰ ἤθεα αἱ ὧραι αἴτιαι μάλιστα, οὐ μεγάλας τὰς μεταβολὰς ποιεύμεναι οὔτε ἐπὶ τὸ θερμὸν οὔτε ἐπὶ τὸ ψυχρόν, ἀλλὰ παραπλησίως. With regard to the lack of spirit and of courage among the inhabitants, the chief reason why Asiatics are less warlike and more gentle in character than Europeans is the uniformity of the seasons, which show no violent changes either towards heat or towards cold, but are equable. (Transl. by W.H.S. Jones, *Hippocrates*, vol. 1, p. 115.)

6. Levine, *Hippocrates*, p. 135. Glacken, *Traces on the Rhodian Shore*, p. 88, sees the harmful influence of the treatise as considerably more long-lasting, "If Hippocrates had made it clear that environment, medicine, and ethnology are three different studies, that the influence of climate on the individual was a proper study of medicine and that ethnology required other methods—as indeed his own descriptions prove—the rigorous correlations derived from Hippocrates would not have been pressed so ardently over a period lasting at least 2,300 years, nor would it have been necessary for Arnold Toynbee in our own day to have refuted Hippocrates' ideas in his discussion of the genesis of civilizations."

from other nations in virtually all respects, and the climate of the country is said to be unlike that of any other. Significantly, the Hippocratic opinion that Asia produces a species of men inferior to those born in Europe forms the subject matter of the final paragraph in the text of Herodotus as it survives to this day (IX. 122). Here the Persian king Cyrus remarks that soft men are born in soft countries, and he argues that one cannot expect a nation to produce marvelous fruits and at the same time brave men.[7]

When the Romans considered this question, which they did only incidentally in a variety of literary contexts, their own intensely nationalistic sensibilities colored their view of the effects of climate upon character, and Rome was now pronounced to be, in this respect, the best of all possible worlds. Hygienic considerations are joined by Roman patriotism in the pronouncements of Vitruvius on this subject. In *De Architectura* I. 4. 8, he voices the Hippocratic notion that temperate climates are the most healthful. In VI. 1. 9–11, he argues that since southern climates render nations mentally more acute and imaginative, but less courageous, while northern climates make them more courageous if less acute, it necessarily follows that, by divine ordinance, Rome unquestionably enjoys the best climate on earth, since its location forms the mean between the extremes of heat and cold. Rome has therefore been chosen, Vitruvius concludes, by the divine mind to rule the world.[8]

Although Vitruvius's formulation of the climatic superiority of Rome is the most extensive Roman attempt to link climate and character in a discussion purporting to have hygienic significance, and although it bears the clearest signs of direct transference of Hippocratic ideas to Roman soil, his work is not the earliest instance of such theorizing in the Roman literature. Varro, approximately a generation earlier, had stated in his dialogue *De Re Rustica* (I. 2. 8) that the Italian farmer had two considerations in mind in selecting a plot of land for

7. φιλέειν γὰρ ἐκ τῶν μαλακῶν χώρων μαλακοὺς ἄνδρας γίνεσθαι οὐ γάρ τι αὐτῆς γῆς εἶναι καρπόν τε θαυμαστὸν φύειν καὶ ἄνδρας ἀγαθοὺς τὰ πολέμια. W.W. How and J. Wells, *A Commentary on Herodotus* (Oxford: Clarendon Press, 1912, reissued 1975), II, pp. 336–337, make the interesting observation, "H. throughout assumes the influence of climate on character and institutions. Differences between one folk and another he would trace in part to differences in physical and geographical environment, since he is convinced of the relativity of human institutions.... It should never have been doubted that this anecdote was deliberately chosen by the historian to close his work."

8. Vitruvius, *De Architectura* VI. 1. 11, *Ita divina mens civitatem populi Romani egregiam temperatamque regionem conlocavit, uti orbis terrarum imperii potiretur.*

cultivation: whether the soil would yield a fair return on his investment of time and money, and whether the location of the plot was healthy or not. Earlier in the book (I. 2. 3), the character Agrius had observed that no country seemed to be so totally under cultivation as was Italy.[9] When these two passages are taken together, the conclusion that would seem to follow is that Italy has a remarkably salubrious climate. Indeed, Agrius draws this very conclusion himself in I. 2. 3–4:

> For my part, I think there is none which is so wholly under cultivation. Consider first: Eratosthenes, following a most natural division, has divided the earth into two parts, one to the south and the other to the north; and since the northern part is undoubtedly more healthful than the southern, while the part which is more healthful is more fruitful, we must agree that Italy at least was more suited to cultivation than Asia. In the first place, it is in Europe; and in the next place, this part of Europe has a more temperate climate than we find farther inland.[10]

Not long after the publication of *De Re Rustica* the arguments of Agrius appeared in poetry in the second book of Virgil's *Georgics*. Here the poet includes an extensive encomium on Italy (II. 136–176) in which he comments, in line 149, upon the perpetual spring (*ver adsiduum*) which created the race of the Caesars. Again, the superiority of the location, because it is constantly temperate, has produced excellent crops *and men* (*magna parens frugum, Saturnia tellus,/magna virum*, II. 173–174). By pronouncing the climatic superiority of Rome specifically responsible for the strength of Rome, Virgil has carried Varro's argument one step closer to the Vitruvian position.

In his *Roman Antiquities*, published in 7 B.C., Dionysius of Halicarnassus shares Virgil's enthusiasm for Italy in his statement (I. 36. 2) that, for its size, Italy is the greatest country on earth. Although Dionysius mentions the abundant rivers, forests, and pasturelands as evidences of her superiority, he singles out the temperate climate as the most important factor in Italy's greatness, a climate which he notes—in good Hippocratic

9. *Ego vero, Agrius, nullam arbitror esse quae tam tota sit culta.*

10. Marcus Terentius Varro, *On Agriculture*, with an English translation by William Davis Hooper, revised by Harrison Boyd Ash (London: Heinemann, 1934), p. 169.

fashion—causes harm neither by excessive heat nor inordinate cold.[11]

Under the Roman Empire, reflections on the climate of the city occur most especially in technical treatments of Roman hygienic advances. The thirty-first book of Pliny's *Naturalis Historia*, for example, discusses the curative properties of waters. Here Pliny shows himself to be an ardent enthusiast for the health-promoting properties of the aqueducts. He makes the interesting statement (XXXI. 24. 41) that the award for the healthiest water on earth goes to that brought by the Aqua Marcia, water which is a gift of the gods to the city of Rome. In the same passage Pliny's curious wording on the course of the water from its source to Rome implies that the water has itself an almost magical desire and conscious will to promote the health of the city: "It rises in the extreme end of the Paelignian range, crosses the country of the Marsi and the Fucine lake, plainly making straight for Rome."[12] God and nature are now viewed as working together to prove that the location of Rome is the ideal site for a city.

In these classical discussions of climate and health, which span seven hundred years, there is noticeable over-all continuity of approach but also a gradual movement away from the initial Greek position. The Greek tendency to weave the cultural biases of national pride into scientific considerations of environment becomes, if anything, more pronounced in the Romans, but the latter made the significant innovation of attributing their climatic superiority to divine plan. The absence of this trait from the Hippocratic treatment is exactly what we would expect of the medical school of Cos, which eschewed divine explanations of human conditions.

The seven hundred years which separate *Airs, Waters, Places* from Pliny's *Naturalis Historia* mark the same centuries during which the

11. Dionysius of Halicarnassus, *Roman Antiquities* I. 37. 5, πάντων δὲ κάλλιστον, ἀέρα κεκραμένον ταῖς ὥραις συμμέτρως, οἷον ἥκιστα πημαίνειν κρυμών ὑπερβολαῖς ἢ θάλπεσιν ἐξαισίοις καρπῶν τε γένεσιν καὶ ζῴων φύσιν. But the finest thing of all is the climate, admirably tempered by the seasons, so that less than elsewhere is harm done by excessive cold or inordinate heat either to the growing fruits or grains or to the bodies of animals. (Transl. by E. Cary in Loeb Classical Library edition, Cambridge: Harvard University Press, 1937.)

12. Pliny the Elder, *Naturalis Historia* XXXI. 24. 41, *oritur in ultimus montibus Paelignorum, transit Marsos et Fucinum lacum, Romam non dubie petens.* The translation is from Pliny, *Natural History*, with an English translation in ten volumes by W.H.S. Jones (Cambridge: Harvard University Press, 1938, reissued 1963), VIII, p. 403.

Jewish sages contributed to the great body of oral interpretation of biblical law which was compiled and edited in A.D. 192 by Rabbi Judah the Prince. This oral legal interpretation, termed *Mishnah*, was necessary to enable pious Jews to live fully in accord with the injunctions of the Pentateuch, injunctions which often were cryptic or seemingly irrational. The *Mishnah*, or oral law, itself inspired a large body of commentary called *Gemara*. About A.D. 500 the latter was published with the *Mishnah* to form, together, the Talmud. Because the need to maintain cleanliness and avoid contagion, physical and ritual, was central to the biblical conception of godliness, the Talmudists, in seeking to interpret the meaning of the Bible, had frequent occasion to discuss medical and hygienic matters. Not a few of the rabbis whose pronouncements found their way into the Talmud were practicing physicians, but because the medical lore of the Talmud lies buried in a work in which medical matters are entirely incidental to the religious and legal questions that formed the central concern of the rabbis, the sometimes remarkably enlightened medical views of the rabbinic Jews, especially in the areas of medical ethics and pathology, have not exercised the influence upon medical science which their soundness might have warranted.[13]

Rabbinic curiosity about man's place in his environment went beyond the practical need to live in accord with God's will and extended to speculations quite as abstract as those of the Hippocratic *Airs, Waters, Places*. A large part of rabbinic climatic speculation is contained in the *Gemara*. While medical lore in the *Gemara* is in general later than that in the *Mishnah*, the rabbinic tendency to quote authorities anonymously makes it extremely difficult to date most Jewish medical advances. What is certain, however, is the existence among Jewish thinkers of an early and abiding interest in climate and its relation to health, which manifests itself in a manner curiously akin to its appearance in the writers of pagan antiquity.

The source of rabbinical medical knowledge is a matter of speculation. It is known that in numerous cities in biblical lands the Jews maintained rabbinical academies where medicine was discussed, at least as it pertained to religious law. In the Hellenistic period the largest colony

13. For a consideration of Talmudic advances in the areas of pathology, anatomy and physiology, and medical ethics, see Stephen Newmyer, "Talmudic Medicine: A Classicist's Perspective," *Judaism* 29 (1980): 360–367.

of Jews in the world, numbering more than a million, resided in Alexandria, and it is natural to conclude that the rabbis came under the influence of Alexandrian Greek medicine. In his essay, "The Contribution of the Jews to Medicine," Arturo Castiglioni presents this opinion in his statement, "Jewish philosophers and physicians participated actively in the flourishing science of Alexandria and, at the time of the Ptolemies, enjoyed a great popularity. The Greeks were then inclined to admire these strange people and to accept them in the schools, in the public discussions, and in the professions. . . . Jews adopted Greek as their mother tongue and Jewish students inherited the intellectual legacy of Greece."[14] Some Jewish historians of medicine, on the other hand, have tended to downplay the influence of Greek medicine on rabbinical thinking. Jacob Snowman, for example, has argued that, despite Jewish interest in Greek science, pagan medicine exercised very little influence on Talmudic medicine in the period A.D. 200–600.[15] It is clear that the rabbis feared assimilation and the consequent destruction of Jewish cultural identity by Hellenism; they proclaimed more than once the dangers of Greek learning. The Talmudic tractate titled *Baba Kama*, which deals with damages resulting from theft, contains the comment, "Cursed be the man who would breed swine and cursed be the man who would teach his son Greek wisdom."[16] Yet the very fact that the rabbis felt the need to warn against such study suggests that it exercised a strong attraction upon the Jews. Julius Preuss, in his monumental study *Biblical and Talmudic Medicine*, notes of Alexandria, "From there the Jews derived their education, for here they lived in full equality with the Greeks."[17] While the extent of the influence of Greco-Roman medicine upon Talmudic thinking can never be determined exactly, it is remarkable that the Jews claimed for their climate the same superiority that had been claimed by the Greeks and Romans for theirs.

14. Arturo Castiglioni, "The Contribution of the Jews to Medicine," in Louis Finkelstein, ed. *The Jews: Their Role in Civilization* (New York: Schocken, 1974), p. 193. Castiglioni is inclined to feel that the Jews accepted some of the diagnostic and therapeutic doctrines of Greek medicine while rejecting the theoretical side of Greek science.

15. Jacob Snowman, *A Short History of Talmudic Medicine* (London: John Bale Sons and Danielsson, 1935), p. 9.

16. *Baba Kama* 82b. All translations from the Talmud in this paper are taken from *The Babylonian Talmud*, translated into English with notes, glossary, and indices under the editorship of Rabbi Dr. I. Epstein (London: Soncino Press, 1935, reissued 1948).

17. Julius Preuss, *Biblical and Talmudic Medicine*, translated and edited by Fred Rosner (New York: Sanhedrin Press, 1978), pp. 5–6.

Although the rabbinic Jews did not develop the idea of their national climatic superiority so consistently as the Greeks and Romans, clear hints are spread through the Talmud that Jerusalem indeed had the ideal climate. Significantly, the Talmudic formulation of the concept combines the nationalistic approach to scientific investigation noticeable in the Hippocratic treatise with the religious fervor contributed by the Romans. The Jewish concept of the excellence of the Holy City is medical and spiritual—at once scientific and metaphorical. For Jews in the diaspora, spread abroad at great distances from their homeland, a group which included many whose pronouncements contributed to the Talmud, Jerusalem was the beacon that lit the way in the darkness of exile, a longed-for motherland highly idealized in the minds of faithful persons who had never been there.

The tractate *Baba Batra*, which deals with property rights, contains a passage reflecting the rabbinical conception of the extraordinary climate of the Holy Land. A situation is posited which is typical of the legalistic debates that fill the Talmud. In a dispute over who would inherit the estate if a house should collapse on a man and on his mother, Rabbi Elai, a Palestinian, declared that the heirs of the mother should receive the estate, while Rabbi Zera, who resided in the diaspora in Babylon, maintained that the heirs of the son should inherit. But when Rabbi Zera came to Palestine, he adopted the view of Rabbi Elai, although he had refused to do so while still in Babylon. The *Gemara* on the passage draws the significant conclusion: "From this one may deduce that the climate of the land of Israel makes one wise."[18]

In rabbinical thinking, medical and spiritual categories are sometimes regarded as essentially identical. Residence in Jerusalem was declared inherently equal to freedom from disease, and freedom from disease equal to sinlessness. The tractate *Ketubot*, on marriage contracts, states, "Rabbi Eleazar said: Whoever is domiciled in the land of Israel lives without sin, for it is said in Scripture, *And the inhabitants shall not say, 'I am sick'; the people that dwell therein shall be forgiven their iniquity*. Said Raba to R. Ashi: We apply this text to those who suffer from disease."[19]

This belief in the climatic superiority of Jerusalem was taken so seriously that the normally rather exclusionist Jews did not seek to keep others away from the Holy City, but were eager to share its salubrious

18. *Baba Batra* 82b.

19. *Ketubot* 111a.

properties with outsiders. Viewing this belief from a specifically spiritual angle, Rabbi Abbahu, in the passage from *Ketubot* examined above, declared, "Even a Canaanite bondswoman who [lives] in the land of Israel is assured of a place in the world to come."[20] Indeed, some Talmudic rabbis sought to portray Jerusalem as a mother-city for the whole world, a center of bodily and spiritual health, perhaps more so than Greece or Rome had been reckoned. The tractate *Kiddushin*, on marriage contracts, sums up this extraordinary character which the Talmudic rabbis sought to claim for Jerusalem: "Ten *kabs* of wisdom descended to the world: nine were taken by Palestine and one by the rest of the world. Ten *kabs* of beauty were taken by Jerusalem and one by the rest of the world."[21] So too, the tractate *Sukkah* states, "He who has not seen Jerusalem in her splendor, has never seen a desirable city in his life."[22]

Some rabbis were much less rhapsodic about life in the Holy City, and felt that climatic conditions there could well benefit from the labors of human hands. To a greater extent than any other ancient people, the Jews, as early as in the biblical period, understood the principle of contagion transmitted by air and water, and many biblical and Talmudic regulations on cleanliness are motivated directly by fear of the spread of disease. The rabbis did not miss the hygienic implications of the biblical statement in *Nehemiah* 11:2 that the people blessed all men who agreed willingly to dwell in Jerusalem. Behind this somewhat less enthusiastic portrait of the Holy City there seems to lurk a recognition of the dangers which may result from lack of clean air and from close crowding of people, and we may detect a hint of the often-expressed Jewish fear of disease resulting from residence in walled cities. In *Ketubot* (104a), the city of Sepphoris is extolled for its high location and its consequently salubrious air. When one Jewish sage fell ill, the text relates, he was taken to Sepphoris to benefit from its lofty location and healthful air. In line with this desire for clean air, the rabbis, echoing Hippocratic dicta about placement of cities with respect to wind direction, recommended that tanyards be restricted to the eastern parts of cities, since eastern winds were considered warmer and therefore more effective in dissipating the noxious fumes that arose from tanning.

20. Ibid.

21. *Kiddushin* 49b. A *kab* is a measure.

22. *Sukkah* 51b.

The fear of pollution from overcrowding inspired several of the ten special regulations which were legislated for Jerusalem by the Talmudic rabbis and which are detailed in the tractate *Baba Kama*. While some of the ten have no distinct hygienic intent, at least four are clearly hygienic. No beams or balconies were allowed to project from houses in Jerusalem, a regulation passed, according to the Talmud "... in order not to form a tent spreading defilement, and not to cause harm to the pilgrims to the festivals."[23] No dunghills were allowed in the city, since it was believed that they attracted reptiles, creatures declared in the Talmud to be capable of defiling water by drinking in wells. No dead person could be kept in the city overnight. Finally, no gardens or orchards were allowed there, for the interesting reason that withered grasses emit a bad odor. The tractate *Shabbath* (63a) reports that cinnamon logs were burned throughout Israel for their health-giving vapors.

The Jewish conviction of the special place held by the Holy Land in the scheme of nature did not die out with the passing of the Talmudic age, but found fervent new expression in the writings of the medieval Jewish physician, philosopher, and poet Jehuda Halevi (ca. 1080–1140), whose remarkable work brings together the strands of national pride, climatic speculation, and religious zeal which, with the striking consistency that we have observed, constituted the environmental doctrine of ancient nations. In his dialogue *Kuzari*, an impassioned defense of the faith of Israel against its increasingly powerful rivals Islam and Christianity, Halevi evidences his familiarity with Greek scientific thinking. One cannot fail to be struck by the clear reminiscence of Hippocratic environmental theory in his pronouncement on the character of man: "For the world is without beginning, and there never arose a man otherwise than through one who came into existence before him, in whom were united forms, gifts, and characteristics inherited from father, mother, and other relations, besides the influence of climate, countries, foods and water, spheres, stars and constellations."[24] In the second book of the dialogue, the rabbi who is the chief interlocutor defends the Holy Land as special on the basis of its superior fruitfulness

23. *Baba Kama* 82b.

24. Jehuda Halevi, *The Kuzari (Kitab al Khazari): An Argument for the Faith of Israel*, translated from the Arabic by Hartwig Hirschfeld (New York: Schocken, 1971), I. 1, p. 36.

and the excellence of its citizens, "Thou wilt have no difficulty in perceiving that one country may have higher qualifications than others. There are places in which particular plants, metals, or animals are found, or where the inhabitants are distinguished by their form and character, since perfection or deficiency of the soul are produced by the mingling of the elements."[25] In what land, Halevi asks us, is this perfection more evident than in Israel, the land singled out for excellence by God himself?

From Hippocrates to Halevi we traverse more than fifteen centuries, but we do not really travel very far. Our comparison of Greco-Roman and Jewish sources has suggested a strong affinity in the essential features of their climatic thinking, for in both the classical and the Jewish tradition the assumption of national superiority stands as the foundation upon which all further speculation must rest. In other aspects of the ancient experience, such an assumption proved the source of prejudice and war, but in medical science its influence may have been beneficial in the long run. The corollary to the belief that one's homeland is healthiest is the idea that exposure to foreign climates requires precautions and foreknowledge. It may be to this source that we can trace some of the advances of hygienic medicine, a branch of the healing art to which the ancients made valuable contributions.

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25. Ibid., II. 10, p. 88.

Cholera Week, 1844
A Letter of the Rev. Alfred North

MARY NORTH SHIMKIN

ALFRED NORTH (1807–1869) was a Presbyterian missionary from New England. In 1835 the Board of Commissioners for Foreign Missions (ABCFM) assigned him and his bride, Minerva Bryan (1815–1844) to Singapore. The Norths and two other missionaries embarked from Boston and arrived in Singapore in February, 1836, after 171 days at sea and stops in Capetown and Batavia, Java.

The American Mission in Singapore was a staging area for American missionaries for China and India. It was closed in 1843 and the missionaries were redeployed. The Norths, now with four children, selected India for their assignment. They left Singapore on November 17, 1843, and arrived in Madura, India, on January 3, 1844.

Cholera was raging in Madura. The American Mission compound (under a Rev. Dwight), where the Norths were staying, was hit hard by the outbreak. Minerva, the mother, died on January 13. The four children became ill, two seriously, but recovered. Alfred North remained well.

The events were described by Alfred North in a letter to his father, Dr. Nathan North of Boonville, New York. The letter was transmitted to Minerva's mother in Fairfield, New York, and remained in the records of the North family.[1] Much of the letter concerned plans for the children's return to the United States while their father remained in India for three additional years.

The first two long paragraphs, reproduced in the following section, provide a personal account of epidemic cholera before the discovery of its cause, prevention, or treatment.

1. Dexter North, *John North of Farmington, Connecticut and His Descendants. With a short account of other early North families* (Washington, D.C. & Concord, N.H.: The Rumford Press, 1921), p. 322.

Transactions & Studies of the College of Physicians of Philadelphia ser. 5, vol. 5, no. 1 (1983): 13–17.

The Letter

My mind is still haunted by the scenes of the awful cholera week at Madura. Out of a population of 30,000, a hundred and twenty a day were dying when we arrived, as tho' 60 a day were to die at Utica for 3 or 4 weeks. Out of Mr. Dwight's house and premises 7 died that week, viz., Mr. Dwight, Mrs. North, Mrs. Cherry, two of my servants, & two of Mr. Dwight's. Mrs. Dwight, Mr. Mussey, Edwin, Martha, and several others escaped by a hair's breadth. Our attention was so occupied by the care of the sick, that it was no easy matter to get a snatch at a mouthful of toast & tea, or obtain leave of absence for a short nap. The house was filled with hurryings to and fro, with mustard and blister plasters, with vomitings and diarrhoea, with hot things, with cramps, groanings, and giving up the ghost. A person would die, in one part of the compound, and be buried, and it not be heard of in the others for two or three days. When the fury had passed over a little, we put away our accumulated bottles, shaved our heathenishly long beards, washed, changed our clothes, ventured out of our dark rooms, beheld the light of the sun, and were thankful. The sick children, too, peeped out and smiled, unconscious of their great loss.

The day before Mrs. N. died, I told her that we had given her up, her symptoms being quite hopeless. She replied that she had come to the same conclusion the day before; that she had committed the children and her own soul to Christ, and was ready. She told me not to be agitated, lest I should have the cholera. I asked whether she had any message for her mother & sister & brother. She answered that she had this message: That she was not sorry for having come to India. She then gave directions about her clothes and the children. She added, that if I should be disposed to marry again, I ought to be exceedingly cautious in the selection of a wife. All these things were said in a whisper, with my ear close to her lips, she being too feeble to speak loud. She soon lost her sight and hearing altogether, began to talk wildly, to toss about, and to show surprising strength. The tossing began to subside into a waving of her head and neck from side to side, with loud groans. These groans the children speak of to this day; little Ann calls them "Ma's crying." Eddy and Martha were at that time on couches in the room, not yet recovered from their dangerous attacks, and Ann had a diarrhoea. Their

Figure 1 (page 15). First page of letter.

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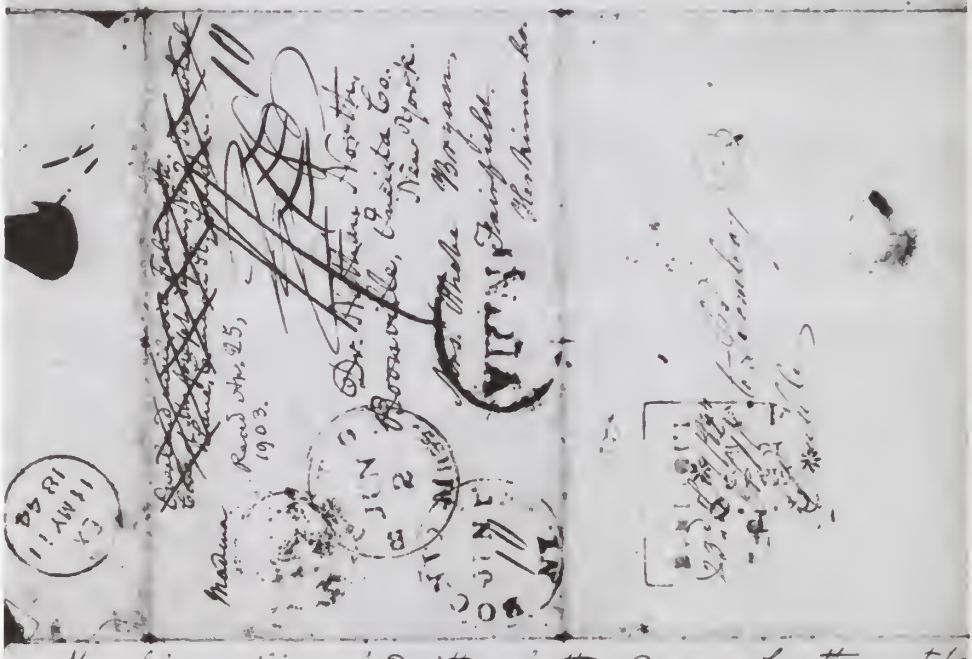
And now you will of course see that one of the very first things to be done, is, to send them home. To keep them from heathenism would take up my whole time. How their grandparents will look about receiving them, I can not tell; but I have no doubt they will do for them all they can. I have thought of sending only the three youngest, and keeping Edwin five years longer, till he is 12; but this is doubtful. He would be both a help and a comfort to me, but it would not be for his own advantage, in some respects. Whether it is a law of the Board that certain sums may be drawn for missionaries' children when they are kept by their

relatives, I am not sure; I think it is. I will make further inquiry and let you know, and how much it is per year. I debated this letter overland, to let you know that you may expect them as soon as there is a good opportunity. Some months may pass away before one occurs. When a passage is engaged, I shall dispatch another overland, which will reach you several weeks before the vessel conveying the children arrives at Boston or N. York. With them a letter will be sent, telling you where you are to find them. With them will go some chests of their mother's clothes to be divided among those who have the care of them; and, which will pay their expenses for some little time, together with some unmade cloth, to be made up for them in your own way. This will be better than to send the clothes ready made. Their outfit clothes I shall have made rather large, to be worn some time after they get home, at least in the warm part of the year. Your terrible winters, spring, and autumns, will be new to them, and will make thick clothing necessary; but I shall send enough with them to pay the expence of this for a time, so that you will not immediately be burdened with it.



Meanwhile you will correspond with each other, and arrange how they are to be disposed of, so as to be ready, on their arrival, to enter at once upon the arrangement. I have much confidence in this government. What its position is now with respect to such things, it is, of course impossible for me to say. If Mr. Ely should offer to take one, I should be glad. If one and then another should not be practicable, it is possible that your families may not be able to take even one, especially if Lavina should not be with you. What Mrs. Bryan's broker-shop is, I can not so much as guess. It may even be thought best to the Rev. Comr. to bind one or two of them a home among strangers, which perhaps we ought not to be so greatly terrified at, if they are not liable to ill-treatment families. Among a thousand uncertainties, a few things are certain: They must be sent to America; their parents & grandparents have always been peculiar objects of the divine care, and have many great & precious promises. ——— Mr. Clarke thinks of your home; if he does, the children will have an excellent guardian. this hour, in the Western Port of N. York, so that you may have to make a journey rather than write. Send this to Fairfield. N. Y.

mother lived about 24 hours after the above conversation. Her eyes & cheeks were frightfully sunken. When she was carried out to be buried, and for a few hours before her death, I had the children confined to another room, hoping to conceal the fact from them for two or three days, till they should get stronger, lest their grief should aggravate their disease; but Mrs. Dwight's children ran in and told them. The two oldest wept; but such things are forgotten by children surprisingly soon; they can not understand what they have lost.—Rev. Mr. Crane read over her the beautiful burial service of the chh. of England. Her grave is close to those of Mrs. Cherry, Mr. Dwight, and Dr. Steele, under the ancient wall of the city (now mostly pulled down by the Eng. govt.) in a lonely but pleasant corner, shunned by the natives as a haunted place. I shall have a cheap stone put up. The children now & then remind me of my promise, that if, on their way to America they pass through Madura, they may all go and see the place where their mother sleeps.

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Figure 2 (page 16). Second page of letter.

The British School of Observation

THE *British school of observation* may fairly enough be said to have commenced with Sydenham; and its general spirit and principles have continued almost entirely unchanged to the present time. This school has been marked by some of the strongest and best qualities of the British character, —sagacity, shrewdness, and sound common sense. It has been regularly progressive since the time of Sydenham, and it has accumulated a vast amount of most excellent practical knowledge. Its therapeutical resources have been more various and extensive, than those of its continental rival; and if it has done less for the advancement of medicine, as a science, it can hardly be doubted, I think, that it has accomplished more, as a useful and beneficent art. Amongst the models and ornaments of this school, may be mentioned Sydenham, Huxham, Cleghorn, Heberden, Blane, Pringle, Thomas Percival, John Cheyne, Thomas Bateman, Samuel Black, William Woolcombe, William Brown, Sir Henry Marsh; and many others, their worthy successors, might be added, —the pride and glory of the actual period of British medicine.

The principal defects of the British school are its want of comprehensiveness, of rigorous and positive conclusions, and the habit of mixing up, with its observations, reasonings and interpretations altogether hypothetical in their character; and then of regarding these reasonings as more important, more valuable, more essential to the constitution of science, than the observations upon which they are founded. . . .

Elisha Bartlett, *An Essay on the Philosophy of Medical Science* (Philadelphia: Lea and Blanchard, 1844), pp. 301–302.

Some Excerpts from the Writings of Stephen Hales, with Comment on their Relation to the Concept of Heart Failure

SAUL JARCHO

STEPHEN HALES (1677–1761), the famous physiologist, was a Church of England minister, not a physician.[1] Entering Cambridge University in 1696, he received the degree of Master of Arts in 1703 and became a fellow of Benet College, now Corpus Christi. In 1709 he left Cambridge to take up pastoral duties. While at the university he performed experiments in chemistry, made an orrery, and occasionally collected plants. It is thought that as early as 1706 he also did experiments on the blood pressure of dogs. These and other researches on circulation, to which he later added numerous experiments on secretion and muscle function, were resumed about 1712–13 and were continued at irregular intervals—intercurrently with famous fundamental experiments in plant physiology—during the subsequent five decades of his life.

Hales's thinking was influenced by the work of Newton and by the iatrophysicists, especially Borelli, Baglivi, and Keill. In the preface to his *Haemastaticks (vide infra)* he says, ". . . And as the animal Fluids move by Hydraulick and Hydrostatical Laws, so I have here made some enquiry into the Nature of their Motions by a suitable Series of Experiments." Elsewhere in the same preface he further explains some of his basic attitudes: ". . . in natural Philosophy, we cannot depend on any meer Speculations of the Mind; we can only with the Mathematicians, reason with any tolerable Certainty from proper Data, such as arise from the united Testimony of many good and credible Experiments". To this he immediately adds: "Yet it seems not unreasonable on the other hand, tho' not far to indulge, yet to carry our Reasonings a little farther

1. A. E. Clark-Kennedy, "Stephen Hales, D.D., F.R.S., Physiologist and Botanist," *Lancet* 1 (1927): 1308–14; idem., *Stephen Hales, D.D., F.R.S. An Eighteenth Century Biography* (Cambridge: University Press, 1929); Francis Darwin, "Stephen Hales," *Dictionary of National Biography* (New York: Macmillan, 1908), vol. 8, pp. 916–20; Henry Guerlac, "Stephen Hales," *Dictionary of Scientific Biography* (New York: Scribner's, 1972), vol. 6, pp. 35–48.

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than the plain Evidence of Experiments will warrant; for since at the utmost Boundaries of those Things which we clearly know, there is a kind of Twilight cast from what we know, on the adjoining Borders of *Terra incognita*, it seems therefore reasonable in some degree to indulge Conjecture there; otherwise we should make but very slow Advances in future Discoveries, either by Experiments or Reasoning . . ."

In his experiments on the physiology of animals Hales studied many of the properties of the circulation, such as arterial blood pressure and its response to deep breathing and progressive exsanguination; venous pressure; the capacity and output of the heart; the resistance in peripheral blood vessels; and the relation between blood pressure and pulse rate and the size of an animal. In a group of experiments on the pulmonary circulation he calculated the surface of the pulmonary blood flow and the velocity of the pulmonary blood flow, and he undertook direct microscopy of the pulmonary capillaries in live animals.[2]

In his researches he constantly and correctly emphasized measurement. As Fulton has put it, Hales "took the next important step after Harvey and Malpighi in elucidating the physiology of the circulation."[3]

The following excerpts have been taken from Hales's *Statical Essays. Vol.II. Containing Haemastaticks* . . . (London: Innys and Manby [et al.], 1734).[4] Bracketed numerals are page-numbers.

Excerpts from Hales

EXPERIMENT XII.[5]

1. I Made an Incision of two Inches length between the Ribs into the Thorax of a Dog, on the right Side: At first opening the Lungs were dilated so as to fill up the Cavity of the Thorax, for they pressed against the inward Orifice of the Wound, and continued in this State for some

2. *Haemastaticks* (1733), Experiment X, pp. 63–72.

3. John F. Fulton, ed., *Selected Readings in the History of Physiology* (Springfield, Ill.: Thomas, 1930), p. 57.

4. *Statical Essays* is an immortal and confusing work. The present discussion is based on the two-volume edition published in 1731–33. In this unhappy composite, vol. I is the third edition of Hales's *Vegetable Staticks,* while vol. II, from which the excerpts were drawn (*vide infra*), is the first edition of his *Haemastaticks.* A reprint of *Haemastaticks,* issued by the New York Academy of Medicine in 1964 and published by Hafner, contains a valuable introduction by André Cournand.

5. Hales, *Haemastaticks* (1733), pp. 77–82.

time: But then as this right Lobe of the Lungs fell gradually more and more, so the Dog shewed more and more Uneasiness in breathing; and on dilating or contracting the Thorax by the Action of the Diaphragm, the Air rushed briskly in and out at the Incision; But when the Orifice was Covered by drawing the Skin over it, the Dog immediately breathed in a natural easy manner.

2. Hence we may observe, that the Lungs Continuance in a dilated State, for some time after the Orifice was made, must be owing to the Force of the Blood in the pulmonary Artery, in the same manner as the nitrated Blood in Exper. XI. Numb. 4. dilated those Lungs. [78] For since the Substance of the Lung is of a very flaccid Nature, they must needs collapse, when the Air equally pressed on them both within and without.

3. Hence also we see that this Dilatation of the Lungs, which arises only from the Force of the blood in the pulmonary Artery, is not alone sufficient to promote the Passage of the Blood thro' them; but there is also requisite a farther Dilatation of the Coats of the Vesicles with inspired Air; thereby probably to unfold the corrugated Extremities of the Arteries and Veins, and so to give the Blood a freer Course thro' them. For tho' in Experiment the first, it was observed that on deep sighing, that is on much dilating the Lungs, the Force of the Blood in the Horse's Arteries was greatly increased, which was occasioned by the Blood's flowing more plentifully thro' them when they are dilated than when fallen; yet we cannot hence infer that the Blood flows more freely thro' them also when they are thus dilated by the Force of the arterial Blood, without the joint Dilatation also by the inspired Air.

4. But when for want of this Dilatation of the Vesicles by the Air, the Blood's free Course [79] was in this Dog thus retarded, it must needs therefore flow in much less Quantity to the left Ventricle of the Heart, which being thus deprived of a sufficient Supply, the Force of the whole arterial and venal Blood of his Body must be proportionably rebated, and consequently a less Supply coming from the Veins, to the right Ventricle of his Heart, the Force of the Blood in the Pulmonary Artery being much abated so as not to be sufficient to dilate the Lungs, they collapse: So that if a Tube had at the same time been fixed to one of the carotid Arteries of this Dog, no doubt but the Blood would have subsided considerably in the Tube.

5. But when on straining, the Dog, by the joint Action of all the Muscles of his Abdomen, thereby compressed the venal Blood forcibly

up into the ascending Vena Cava, the right Ventricle of the Heart being thereby more plentifully supplied with Blood, impelled it also more forcibly into the pulmonary Artery, so as to make the collapsed right Lobe of the Lungs instantly to dilate, so vigorously to push the lower part of the Lobe, one, two, and sometimes three Inches length out thro' the Incision; and that after he had lost half a [80] Pint of Blood. But when more than half of his Blood was evacuated, then the right Lobe did no more dilate on this straining.

6. Hence there does not seem to be so much danger as has been imagined in the Paracentesis or Incision into the Thorax, in order to take away an Abscess, &c. for tho' while the Orifice was open, this Dog breathed with Difficulty, yet the left Cavity of the Thorax being by means of the Mediastinum still closed, the left Lobe of the Lungs play'd too and fro to such a Degree, that the Dog breathed enough to keep up the Circulation of the Blood for more than a Quarter of an Hour, that I purposely try'd: And the Uneasiness in breathing, not increasing in so long a time, it is reasonable to believe that he would have lived in that manner, for some Hours. But if the left Cavity of the Thorax has also been open at the same time, he would doubtless have died soon. Now supposing one Cavity of Man's Thorax to have been open'd and the Operation that was thereby intended, perform'd; if just before the incision be closed up, the Man be made to strain, and thereby strongly contract all the Muscles of his Abdomen, the fallen Lobe of the Lungs [81] will then immediately dilate, upon which the Orifice being instantly covered with a Plaster, the Man will then breathe as free as ever. *Qu[estion].* Will strongly girding or compressing the Abdomen do the same thing?

7. But in case the Lungs themselves are pierced with a Sword or Bullet, then this straining must needs be hurtful, because it will much increase the Effusion of Blood.

8. Hence we may see how dangerous it is for those, whose Lungs are so weak as to be subject to break, to use strong Exercise or Motion; for when a Man either strains, or is using violent Exercise, so as either to have the Blood impelled more forcibly into the right Ventricle, or by running, &c. to have the Ventricle beat instead of seventy five times, one hundred and twenty times in a Minute, then the Blood must needs be very forcibly impelled into the Lungs.

9. In which case the Blood being greatly accumulated in the pulmonary Artery, the Lungs will consequently be considerably dilated,

so as to subside but little in Expiration; which may be the Cause of those finall but quick Inspirations and Expirations, which Men make in strong or quick Motions. This is [82] what those whose Lungs are considerably wasted or otherwise defective are but too sensible of, even in a small Degree of Motion; for in this case, the natural Course of the Blood thro' the defective Lungs, being much retarded, there is immediately a great Accumalation [sic] of Blood in the pulmonary Artery occasioned by the accelerated Pulses of the Heart: The Capacity of whose right Ventricle, is proportioned to a sound State of the Lungs, as all the Parts of the Animal, both solid and fluid, are in a healthy State, admirably tempered and adapted to each other; but in a defective State of the Lungs, they are too easily surcharged with Blood, so that the unhappy Person is ready to be choaked; that is the Blood does with very great Difficulty and in but small Quantities pass the Lungs, to supply the Demands of the left Ventricle of the Heart, without which Life instantly ceases.

10. There is probably also the like Accumulation of Blood in the Pulmonary Artery, in pleuretic Cases, when the Blood by its Siziness does with difficulty pass, tho' impell'd with such Force as to distend the Vessels, and thereby cause pungent Stitches. . . .

EXPERIMENT XIV.[6]

1. When I had seen to what Height the Blood would rise in Tubes fixed to the carotid Arteries of several Dogs, then taking away that Tube, I immediately affixed to the Pipe that was inserted into the Artery another Tube, which was four Feet and half high, to the middle of the Tunnel which was fixed on the top of it: Then cutting open both the jugular Veins, blood warm Water was poured into the Tunnel, which flowing down thence from a perpendicular Height equal to that of the arterial Blood in the former Tube, was by this means impell'd thro' all the arteries of the Body with a Force nearly equal to that with which the Blood was propelled by the Heart, and was thence carried with the venal Blood out at the Jugulars; where the flowing Blood became more and more diluted with Water, till the Dog died, after which very little Water would pass out at the jugular Veins. When the Column of Water in the Tube was 9 + ½ [page 115] Feet high, the Blood then flowed more briskly out at the Jugulars.

6. Experiment XIV (pp. 114–26) contains 18 numbered sections. Only the first six (pp. 114–16) are included in the present excerpts.

2. The Dogs constantly died when the blood grew very diluted with Water; whence we see the meer keeping the Arteries full with any Fluid will not support Life: No wonder then that the Lamp of Life burns more and more dimly, and is in further and greater danger of being extinguished, in proportion as that noble vital Fluid the Blood, became more and more depraved.

3. It was observed that the Dogs constantly expressed great Uneasiness instantly as soon as the blood warm Water entered the Arteries and mixed with the Blood. Hence if our Drink entered the Blood-vessels at once it would be most pernicious; but Nature gradually assimilates it, by first mixing it with the Chyle, and other Juices, which are in great Plenty secreted from the Glands of the Stomach and Guts, as also from the Liver and Pancreas, and from the mesenteric Glands; which Commixture and Assimilation is incessantly carrying on by infinite Mixtures in the circulating Vessels, without which the Blood could not be diluted, but its strongly attracting Globules would soon coalesce.

[116] 4. This warm Water, thus mixed with the Blood, did usually make the Dogs vomit, especially when the Column of water was 9 + ½ Feet high; whence we see that warm Water in the Blood has the same Effect, in giving a convulsive Motion to the muscular Fibres of the Stomach, as when taken inwardly, in which case it is well known to cause a Nausea and Vomiting; a probable Argument that some of it then soaks immediately out of the Cavity of the Stomach among its muscular Fibres.

5. And it has the like Effect upon all the Muscles of the Body; for when the Water enters the Muscles two or three Minutes after the Dog is manifestly dead, then all his Muscles are in strong Convulsions, and that for some Minutes.

6. If the warm Water was continued thus flowing into the Artery for half an Hour, or two Hours, all the Parts of the Body would during that time, be continually swelling bigger and bigger, so that there would be a universal Dropsy over the whole Body; both the Ascites and the Anasarca: the salival and other Glands were greatly swell'd and the Mouth and Nose filled with mucose slimy Matter [117] which flowed from those Glands; The Ubera were much distended by the filling of their fat Vesicles, as were also all the fatty Vesicles of the Body. All the Muscles were swelled and the Interstices of their Fibres filled with Water; and some of them were by this means washed white. All this was

effected with a Force of Water no greater than that of the arterial Blood in its natural State.

7. Whence 'tis probable that no Vessels were broken to make way for this universal Inundation; but the penetrating Water might readily pass thro' Pores, and such fine secretory Ducts, as the more viscid Part of the Blood in its common Course of Circulation never enters; but thro' which its more attenuated and diluted Parts do in their due Proportion pass . . .

Comment on Hales

In Experiment XII, of which an excerpt is given above, Hales studied the effects of thoracotomy in the dog. He found that on the side of the incision the lung became steadily smaller and the animal became dyspneic, but when the wound was occluded the dyspnea disappeared. He suggested that in thoracotomy in man, the patient should be made to strain just before the wound was closed, since this maneuver would reduce the collapse. He concluded also that the operation of thoracotomy was less dangerous than it had been thought to be.

His observation on the collapsed lungs convinced him that the force of the blood in the pulmonary arteries is not sufficient to maintain the passage of blood through the lungs unless the vesicles are dilated by inspired air.[7] In the absence of such dilatation, Hales supposed, the transit of blood is retarded and flow into the left ventricle is reduced. Hence "the Force of the whole arterial and venal Blood of his Body must be proportionably rebated [reduced]." Consequently less blood would pass from the peripheral veins to the right ventricle, the force of the blood in the pulmonary artery would be reduced, and the lungs would collapse.

In this passage Hales has set forth what amounts to a concept of circulatory failure, presented as a continued series of events beginning with collapsed vesicles and reduced pulmonary perfusion. As will be evident to the reader who examines the excerpts given above, this suggestion rests on a very small amount of observation and a large amount of supposition. At this point the reader may wish to reexamine the introduction to the present essay, which reproduces some of Hales's

7. *Haemastaticks,* Experiment XII, § 3–4, pp. 78–79.

remarks on the roles of observation and conjecture in the progress of the natural sciences.

In another series of paragraphs Hales mentions the danger that threatens a person with weak or fragile lungs who does violent exercise, which increases both the rate of the heart and the force with which blood is impelled into the lungs.[8] This causes the blood to accumulate in the pulmonary artery (the pulmonary capillaries are not mentioned); consequently the lungs become dilated. This, says Hales, may be during vigorous exercise. In those whose lungs are diseased,[9] the blood is retarded—in the pulmonary capillaries (?)—and it accumulates in the pulmonary artery because the heart is accelerated and the capacity of the right ventricle is normal. Defective lungs easily become overloaded with blood, "so that the unhappy Person is ready to be choaked . . ." Since blood cannot come through the lungs in quantities adequate to supply the left ventricle, the patient dies.

Hales imagines, further, that in cases of pleurisy sizy blood may encounter difficulty in passing through the lungs.[10] The consequent accumulation would distend the pulmonary artery, causing "pungent Stitches."

In another chapter,[11] not included in the present excerpts, Hales considers the heat of the blood. He concludes that one important function of the lungs is to cool the blood. He goes on to make the following interesting remark:

> 'Tis Probable also that the Blood may in the Lungs receive some other important Influences from the Air, which is in such great Quantities inspired into them. It has long been the Subject of Enquiry of many, to find of what use it is in Respiration, which tho' it may in some Respects be known, yet it must be confessed that we are still much in the dark about it.[12]

Experiment XIV, excerpted above, contains a series of bold and ingenious studies on the effects of water on the circulatory system. Warm

8. *Haemastaticks,* Experiment XII, § 8–10, pp. 81–82.
9. Ibid., p. 82.
10. Ibid.
11. Experiment XIII, pp. 87–114.
12. Ibid., pp. 105–6.

water was injected into the carotid arteries of dogs at a pressure equal to the normal arterial pressure; at the same time the jugular veins were opened. The blood that flowed from these veins became increasingly dilute and the dogs died. This showed that "the meer keeping the Arteries full with any Fluid will not support Life."

The intra-arterial infusion of warm water was kept flowing after the death of the animals and produced universal dropsy—both ascites and anasarca. All the muscles became swollen and water appeared in their interstices. The volume of the infusions is not stated.

* * * * * *

The preceding pages contain a few selections reprinted and discussed because of their bearing on clinical problems, chiefly the problem of congestive heart failure. On this score Hales propounds two suggestions or hypotheses. The first has to do with pneumothorax.[13] When a lung is collapsed, the "force" (pressure) in the pulmonary arteries, he asserts, is not great enough to drive the blood forward. Consequently blood will reach the left heart in inadequate amounts and pressure in the entire circulatory system, both arterial and venous, will be reduced. Since flow from the great veins to the right heart would be inadequate, the lungs would collapse. In other words, pulmonary collapse would cause pulmonary collapse! It is hard to avoid the comment that in the passage under discussion Hales reasoned in a circle—from both the anatomical and the logical point of view.

In a subsequent passage Hales tells of the dangers that may be produced by excessive exercise in a sufferer from pulmonary disease.[14] The accelerated heart drives blood with excessive force into the lungs. Accumulating in the pulmonary artery, the blood expands the lungs. If the lungs are diseased, they are readily overloaded and the patient may choke. Moreover, blood may pass through diseased lungs in inadequate amounts. Therefore the left ventricle would be poorly supplied, with fatal results.

Both suggestions or hypotheses clearly involve concepts of circulatory inadequacy, and both involve interactions between the heart and the

13. *Haemastaticks,* Experiment XII, § 3–4, pp. 78–79
14. *Haemastaticks,* Experiment XII, § 8–10, pp. 81–82.

lungs. This seems more significant than the fact that both concepts are inadequate and conjectural. They are the random thoughts of an experimenter, not hypotheses derived from observation. But even as random thoughts they must be characterized as a historical retrogression, less advanced than the concepts previously developed by Vieussens and Lancisi. This must not be interpreted as reducing by one iota the very great value of Hales's experimental contributions to physiology.

It is possible that Hales's comments on the dangers in pulmonary disease are really a reference to Sydenham's innovation, the treatment of phthisis by horseback riding.[15]

Finally, the experimental production of dropsy by the intra-arterial infusion of warm water is an interesting and valuable achievement, easily overlooked in the plethora of Hales's other experiments.

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15. Thomas Sydenham, *Processus Integri* [1692], in John Swan, ed., *The Entire Works of Thomas Sydenham*, second edition (London, 1749), p. 614; see also Saul Jarcho, "Amy Lowell and the Death of John Keats," *Clio Medica* 12 (1977): 91–95 (esp. pp.93–94).

William Darlington, M.D. 1782–1863*

DOROTHY I. LANSING

WILLIAM DARLINGTON'S unusual stature in his community and his time was not a freak of early America. This physician, a medical graduate of the University of Pennsylvania (1804), was able to acquire the basis of scientific thought and experimentation despite his crude rural surroundings. In addition he was a national politician, a would-be governor of the state of Pennsylvania, a working banker, a builder of schools, roads, and railroads, and at the same time a farmer and a scholarly botanist.[1] He practiced village medicine for 34 years.[2] His expertness in botany is the key to his great productivity. His knowledge was not the result of a hobby, although during the last 100 years he somehow came to be regarded as a hobbyist. He was a competent, working, scholarly, agricultural and medical botanist who lived at a time when there was no way for him to support his family as a botanical consultant, whether to governments, farmers, medical schools, or pharmaceutical manufacturers. That there then were many other like-minded men (and a few women) in the United States is testimony to the eventual ability of United States citizens to lead the world in extraordinarily productive scientific farming. That the education and development of the American scientific farmer has had to be, periodically, the victim of economic conditions is due, not to teachers like Darlington,

1. Darlington Collections of New-York Historical Society, West Chester (Pa.) State College Library, University of Kansas Libraries, American Philosophical Society, Academy of Natural Sciences of Philadelphia, College of Physicians of Philadelphia, Pennsylvania Historical Society, Library Company of Philadelphia, Smithsonian Institution, National Library of Medicine, Library of the Gray Herbarium at Harvard University, Chester County (Pa.) Historical Society; minutes and annual publications of Chester County Cabinet of Natural Sciences, West Chester State College Library.

2. William Darlington, *Obstetrical Synopsis (1800–1834).* This manuscript volume is a transcription by Darlington from his *Medical Diaries*, one of which (1801–1812) is at the Chester County Historical Society along with the *Synopsis*.

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but to difficult monetary problems in difficult times. Recurrent disasters in the agricultural financial markets are not inherent in the *scientific* development of American farming. Yet we no longer witness the perpetually exciting quest for new and useful botanical species that existed in Darlington's time. Commercially, we still get along on the same 30-odd plants that have long been our main food supply. As René Dubos has stated, many species that are currently ignored could be used to expand our list.[3]

In the past, anecdotal evidence attached to many American plants the reputation of being able to cure everything from headache to cancer. Newspaper publicity would rename a plant several times over: different common names would appear in the course of years, always with the implication that the plant itself was new and different, and hence newsworthy and curative.[4] This state of affairs was especially galling to Darlington. In 1854 he wrote a comprehensive but cryptic summary of medicinal herbs native to southeastern Pennsylvania.[5] It is a competent and authoritative report. Darlington did not find many of the herbs of the day to be therapeutically potent. In many places, therefore, his statement differs from nostalgic overviews of the medical botany of the rural populace written by popular authors in our times.

William Darlington was astonishingly complex. His natural abilities for leadership aroused the usual jealousy in other ambitious persons so that, on the political scene, he was subject to much subterfuge. In one famous incident he was the victim of Byzantine manipulation.[6] After his death he was regarded as a sweet and innocent rural physician.[7] During his lifetime he was perceived by the ordinary man as a simple, honest, helpful, hardworking, and trustworthy man. His subsequent tenure as president of a bank for 33 years, through two severe national

3. René Dubos, "Beyond the Garden Wall," *The Sciences* 22 (1982): 10–14.

4. William Darlington, *Florula Cestrica. . .* (West Chester, Pa.: Siegfried, 1826).

5. William Darlington, "Catalogue of Medicinal Plants Indigenous to Chester County, Pennsylvania," *The Medical Recorder*, 1854 (house organ of both the Chester County and the Delaware County Medical Societies). Reissued by the Chester County Medical Society,ed. Dorothy I. Lansing (Devon, Pa.: Anro, 1972).

6. Philip Shriver Klein, *Pennsylvania Politics 1817–1832, a Game Without Rules* (Philadelphia: Univ. of Pennsylvania, 1938). Letter to Edward Everett (of Massachusetts) from McIlvaine, 1827, Massachusetts Historical Society. (The author is indebted to Lyman Butterfield for the discovery of this political letter about William Darlington.)

7. John Jay Smith, *Recollections of John Jay Smith* (Philadelphia, 1892).

panics, was instituted by businessmen in order to keep their local money market placid amid the turbulent beginnings of banking in the United States. Circulating dollar bills bore his engraved portrait. The era was one of wildcat banking. Darlington's railroad was taken away from him after 15 years;[8] indeed, the men involved in removing him from the presidency of the West Chester Railroad made a point of removing his railroad pass publicly.[9] The nationally known scientific institution, the Chester County Cabinet of Natural Science, founded in 1826 by Darlington and his friends, was battered so severely that his favorite medical student had to save it by converting it into what is now West Chester State College. But in the end Darlington has prevailed. An entire town—a county—owes to him many of its institutions, organizations, botanical knowledge, herbarium specimens, museum specimens, and gravesite and battlefield restorations. Yet the part that he played in national and international scientific and political life has been forgotten. His talents were so diverse that the biographical articles, pamphlets, and chapters that have been written about him during the more than 100 years that have elapsed since his death are little more that quick glimpses of his life story.[10] His manuscript biography runs to 1000 pages and for economic reasons may prove unpublishable.[11]

For the present essay the important facts of his long life will be interwoven with details about his times and his contemporaries.

Darlington was a fine and competent physician at a time when this

8.William Darlington ("The Oldest Inhabitants"), "History of West Chester, Pennsylvania," *Directory of West Chester, Pennsylvania for 1857* (West Chester, 1857).

9. *Centennial Souvenir of West Chester, Pennsylvania*, (West Chester: *The Daily Local News*, 1899).

10. Howard A. Kelly, *Some American Medical Botanists* (Troy, N.Y.: Southworth, 1914); Howard A. Kelly and Walter L. Burrage, *American Medical Biographies*, (Baltimore: Norman, Remington, 1920), pp. 283–84; Henry S. Pleasants, *Three Scientists from Chester County* (West Chester, 1946); J. Smith Futhey and Gilbert Cope, *History of Chester County*, Philadelphia: Lewis Evarts, 1881); Joseph Ewan, *Dictionary of American Biography*; Washington Townsend, *A Memorial of William Darlington* (West Chester: James, 1863); Thomas Potts James, *Memorial of William Darlington* (Philadelphia: American Philosophical Society, 1863); Dorothy I. Lansing, *Dictionary of American Medical Biography*, ed. Martin Kauffman and Todd Savitt, in preparation; Dorothy I. Lansing, Robert Leeper, and William Overlease, *William Darlington* (Devon, Pa.: Anro, 1965); Dorothy I. Lansing, *Biographical Dictionary of North American Environmentalists*, in preparation; William Harshberger, *The Botanists of Philadelphia* (Philadelphia: Davis, 1899).

11. Dorothy I. Lansing, *Botany, Books and Tombstones: The Life of an Early American Physician, William Darlington 1782–1863*, unpublished manuscript.

did not require much talent, study, or technical knowledge but it is interesting to observe that the medical academic world of the era nipped about the heels of the practitioner, telling him that he had forgotten most of what his teachers had taught him in school, just as some medical academicians may do today.

Darlington was principally a self-taught botanist and a constant lifelong scholar in the field, although he had a degree of indebtedness to Benjamin Smith Barton, William Baldwin, and the Rev. Lewis David von Schweinitz for his initial botanical knowledge.[12] In his Chester County Cabinet of Natural Science he taught botany, medicine, and anatomy to ordinary village folk and to special students.[13] He was an honest and competent builder of roads for the state.[14] He designed and built a school and was responsible for building a railroad; he was a prolific writer on many subjects, including politics. He acquired enough legal competence to compose several legal documents and to serve a term as prothonotary of the courts.[15] He was greatly interested in architecture. In addition to designing the school that he built (1812), he selected the architects who would change the face of his town; this happened in 1830–1850, during the years of heavy construction of American small towns. He influenced almost two generations in agriculture, botany, the arts, and medicine.[16] In 1878, Dr. William Goodell, the commencement speaker at the University of Pennsylvania School of Medicine, exhorted his young men to emulate Dr. Darlington as they

12. B. S. Barton, M.D. (1766–1815), Professor of Natural History at the University of Pennsylvania School of Medicine, suffered from tuberculosis and gout; William Baldwin, M.D. (1779–1819), gave his field herbarium specimens to the banker Stephen Elliott of Charleston, S.C. to describe and publish for him; Lewis David von Schwenitz (1780–1834), bishop of the Moravian Church in North America, was trained in Germany in botany by Albertini and assembled the largest herbarium in the United States.

13. The Cabinet lecture series was a feature of 1830 life in West Chester; profits from it enabled the Cabinet to erect its own building on Church Street.

14. Pursuant to a State Act, William Darlington was chosen to superintend the surveying and building of a road from New Hope on the Delaware River to Port Deposit on the Susquehanna River. His father had built state roads.

15. He was Prothonotary of Chester County (1828–1830), an appointment he received in the mail after David Townsend, a close friend, had resigned. His enemies boasted that he had bought the office.

16. Thomas U. Walter, architect of the U.S. Capitol, was a lifelong friend; Marshall Swayne was a native sculptor of great talent. His subjects included Abraham Lincoln as well as William Darlington.

travelled the road of professional life.[17] Goodell knew whereof he spoke—he had tried to make a living as a village physician in West Chester, Pennsylvania, just before and during the Civil War. He had banked at the institution presided over by Darlington and his best friend, David Townsend. He was aware of the knowledge and the scientific curiosity that existed in the village and the county because of this remarkable man.

William Darlington was born in Chester County, Pennsylvania, in 1782. Since the war with the British had been settled approximately six months before, Darlington can be considered a member of the first genuinely American generation. His parents were birthright Quakers. His early linguistic and musical talents were exceptional. He was a great reader and a bibliophile, and his personal library was outstanding.

Intelligence, talent, goodness, patience, and courage were his in large measure—he came to be known as the Sage of West Chester. His early upbringing was rural. John Forsythe, his Irish schoolmaster at the Birmingham Quaker Meeting House School, taught reading, belles lettres, arithmetic, and bookkeeping; he also gave instruction in the wonders of science. In an apothecary shop Darlington chanced to see Judah Dobson's *Encyclopedia*[18] and this determined the principal focus of his life—science.[19] Totally astonished that he could understand what he was reading and able to query the university-trained apothecary owner, he learned that only in the medical schools of America could he acquire further training.

In 1800 the medical profession was at its apogee of acceptance by the American people.[20] The medical schools were the epitome of all that

17. William Goodell (1829–1894), *Valedictory Address to the Graduating Class of the Medical Department of the University of Pennsylvania* (Philadelphia: Collins, 1878). Goodell tried to succeed in village medicine, and was commandant of Camp Paoli during the Civil War, but he is most famous for being the first professor of gynecology at the University of Pennsylvania.

18. Judah Dobson, *Encyclopedia or Dictionary of Arts, Sciences. . . Miscellaneous Literature* (Philadelphia, 1792–98). The scientific portions were written by James Tyler; it was the first encyclopedia in the United States (personal communication, Murphy Smith).

19. The shop of Edward Bringhurst, apothecary, may now be seen *in toto* at the Mystic Seaport Museum at Mystic, Connecticut. It was a feature of AMA Conventions for years, advertising Smith Kline & French Laboratories.

20. Richard Harrison Shryock, *Medicine in America: Historical Essays* (Baltimore: Johns Hopkins, 1966); idem, *Medicine and Society in America 1660–1869* (New York: New York University, 1960).

was good and right and "scientific." Desiring to ascend "the hill of science a few perches," as an able 18 year old fresh from the plow, Darlington apprenticed himself to John Vaughan, a young physician in Wilmington, Delaware.[21]

Vaughan was constantly performing scientific and therapeutic experiments and attempting to improve the practice of medicine.[21] Endowed with a creative mind, he was astute and in addition possessed organizational talent. He created lyceums, philosophical societies, newspapers, books, compendia, and medical articles. He taught chemistry to ordinary people, and he was inclined toward epidemiology. Although young Darlington ascended the hill of knowledge slowly, because of Vaughan he learned the mechanics of institutional behavior.[23] In imitation of his preceptor Darlington would later found newspapers, lyceums, and societies, and would write books and articles. He became an extended and improved edition of Vaughan.

John Vaughan loved to dabble in politics, and often had to remind himself to give up such high excitement and return to practicing medicine.[24] It was largely his political work that created a base of victory for Thomas Jefferson in Delaware. When the subsequent policies of Jefferson's administration with regard to the spoils system did not suit him, he mounted a counter-campaign for the Federalists and was equally successful at the polls. Young Darlington was pressed into service to compose political poetry, essays, and propaganda for the Jeffersonian Democratic-Republicans; this started him on a quarter century of political writing. In 1807, when he finally returned to Chester County, Pennsylvania and settled down to practice medicine, his talent for propaganda earned him the friendship of newspapermen and politicians influential on the national scene. It also caused him to be vilified by the Federalists, then ascendant in Chester County.

21. John Vaughan, M.D., 1775–1807, can be found in Thatcher's famed *American Medical Biography* (Boston: Richardson, 1828), pp. 154–56: "As a physician and chemist, he was justly eminent; for, though snatched off in the summer of life, he had travelled far in the walks of science. . . [and was] entitled to the character of a great physician."

22. William Darlington, *Medical Recipes, 1802*, manuscript volume, Chester County Historical Society.

23. William Darlington, *Synthetical Register*, 1802–1804, manuscript volume, Chester County Historical Society.

24. Diary of John Vaughan, Winterthur Museum Library, Winterthur, Delaware. The author is indebted to Edward La Fond, Jr., former director of the Chester County Historical Society, for notice of this diary's existence.

Darlington went to medical school in Philadelphia with Benjamin Silliman and John Rush.[25] Silliman obviously had money to spend on his educational lifestyle and a professorship at Yale already awaited him, but he was as interested in chemistry as Darlington was. They longed to be experts in that emergent science.

Darlington, however, did not become a chemist. He saw no commercial future for himself in that science and instead chose investigational botany, then considered an important international endeavor and the bulwark of all commercially important discoveries in medicine, agriculture, and industry. In 1800, botany seemed likely to retain its importance. This assessment proved fanciful, for the German universities were beginning to teach and investigate advances in agricultural chemistry, to investigate possible new chemical drugs, and to create and expand the products of the industrial revolution, a revolution that Darlington recognized but never quite successfully entered as an entrepreneur. At the University of Pennsylvania School of Medicine he came under the spell of Benjamin Smith Barton, professor of materia medica and famous preceptor in a springtime course in botany.

It was difficult for anyone who attended Philadelphia's famous medical school, however much of a chemist or scientist he cared to become, to escape the influence of Benjamin Rush, but Silliman did so. He sent Rush an insulting and disturbing note and stayed away from the great man's lectures.[26] Darlington continued and became a physician. He did not spend the 50 years in continuous practice that is usual among physicians now; he spent almost 35 years in the intermittent medical practice that was then typical. In those days, possession of a farm enabled a family to live, feed, clothe, and house itself. Therefore, physicians such as William Darlington, professionally situated in rural or village practice, worked hard to accumulate money to buy a farm. Once a physician had a farm, his status was won and he could then practice as much or as little as he wished. To accumulate working capital, William Darlington, like his preceptor John Vaughan, taught

25. Benjamin Silliman (1770–1864) was extremely religious, and almost did not take B. S. Barton's Natural History course which he had come to Philadelphia to take along with James Woodhouse's chemistry course. John Rush (1777–1837), the son of Benjamin Rush, unfortunately went insane shortly after obtaining his medical degree. His plight prompted the writing of his father's famous text on the mind (1813).

26. George Corner, ed., *The Papers of Benjamin Rush* (Philadelphia: The American Philosophical Society, 1960).

medical students. His charge was $150 a year because he had assembled a large and valuable library—something that most general practitioners did not have.[27]

Darlington could not buy his farm until 1820. His eventual purchase of a 60-acre farm within the limits of West Chester, Pennsylvania, was made possible by the very large salary that congressmen had voted themselves in 1816, for he had won a congressional seat in 1814. Before that time he had worked hard and had travelled. In 1806–07 he had gone to India, returning with many bolts of India cloth, which he was able to sell in Philadelphia at great profit. The sale financed the purchase of his house and shop within the village of West Chester. Once that was done, General and Mrs. John Lacey of the Pemberton Forge ironworks in New Jersey allowed their daughter Katharine to become his bride, although while Darlington was a mere student of medicine, he had received only rebuffs.

William and Katharine Lacey Darlington were married for more than thirty years. A chronic illness claimed Mrs. Darlington's life in 1847. There were eight children, six of whom survived to adulthood. Many collateral descendants have had distinguished scientific careers, and direct descendants have been businessmen, linguists, architects, military officers, and Episcopalian ministers (William Darlington joined *after* his wife died.). There are now no direct Darlington descendants who are physicians or botanists.

Darlington's fame does not rest upon the accomplishments of his children and grandchildren. His botanical teachings, bibliophilia, political leadership, character, and demeanor placed a host of physician scientists, architects, sculptors, and taxonomic botanists in his debt for his furtherance of their careers. These are men such as William Goodell, the renowned obstetrician of the Preston Retreat and original gynecologist at the University of Pennsylvania; the naturalist and conchologist William Dell Hartman; the physician, reformer, conchologist, and naturalist Ezra Michner; the president of Pennsylvania State University, Evan Pugh; Thomas U. Walter, architect of the Capitol; the sculptor Marshall Swayne; the lawyer-naturalist, Peter A. Browne; and the physician-botanists John Torrey, Asa Gray, William Baldwin, Charles W. Short, and Jacob Bigelow, all of whom worked in the

27. William Darlington, diary begun in 1822, New-York Historical Society.

mainstream of American botany.[28] Darlington was a close friend and congressional reporter for Hezekiah Niles, the famed newspaper editor.[29] He was familiar, as well, with John C. Calhoun, a politician trained in science and law. He knew the social status and power of all such men, and he preserved their letters to him. He corresponded with agricultural and horticultural editors, such as Jessie Buel, and with President John Tyler, on the management of farmlands.[30] In 1804 he gave Jefferson a copy of his inaugural thesis, "The Mutual Influence of Habits and Diseases."

He was the founder and virtual manager of a working "county" herbarium that he repeatedly reclassified as various European styles of taxonomy appeared or prevailed. At his own expense he published four extensive floras. Indeed, he became much involved with the working end of American scientific botany and American agriculture and with the professionalization of academic botany. He encouraged his fellow American botanists to follow the leadership of Asa Gray, who by 1840 had become the full-time professor of botany at Harvard. For these activities and for his encouragement of the young, Darlington is often called the Nestor of American botany.

Through his friendship with Secretary of War, John C. Calhoun, he secured for William Baldwin, his close friend and schoolmate, the post of botanist to the Stephen Long Expedition, organized by the government in 1819–20 to find the source of the Missouri River.[31] Unfortunately, Baldwin died in August, 1819. Baldwin had published sparsely and had given many of his botanical discoveries to others to publish in large geographical compendia while his unusual expertness in the field was unnoticed. For this reason Darlington published *Reliquiae Baldwinianiae* in 1843 to honor Baldwin and to give him credit for his influence and discoveries.

28. William Goodell, M.D. (1829–1894) always acknowledged the leadership and goodness of William Darlington; William Dell Hartman, M.D. (1817–1899), working physician, a botanist who became a conchologist so that he might conquer new worlds in the field of natural science, was a founder of the Chester County Historical Society.

29. N. N. Luxon, *Niles' Weekly Register* (Baton Rouge, La.:State University Press, 1947).

30. William Darlington, Lettercopy Books entitled *Essays and Addresses*, four manuscript volumes, West Chester State College Library.

31. Coveted by the Englishman Thomas Nuttall, this Long Expedition appointment apparently served notice within the world of American botanical science of Darlington's considerable political power. See Jeanette Graustein, *Thomas Nuttall. . .* (Cambridge: Harvard University Press, 1967).

By 1820 a large group of men who were bankers, businessmen, teachers, and farmers in the village of West Chester attached themselves to William Darlington, accompanied him on his botanical expeditions and helped him prepare dried specimens to be used in exchanges and for development of a Chester County herbarium. In 1826 they banded together as the Chester County Cabinet of Science. They prospered for about twelve years, creating an architecturally designed building in 1837. In 1839, when the building was rented to the local militia for a special event, Quaker members were enraged. They departed publicly and took with them a magnificent library that one of the members had deposited.[32] This fiasco was compounded by the intense financial panic of 1837. The scientific institution reeled but it did not fall. In 1850 it saved itself by merging with the West Chester Academy, and the cabinet building was eventually rented out. In 1869 the Academy and the Cabinet became the West Chester State Normal School[33] and grew into the West Chester State College. For many years the valuable Chester County Cabinet herbarium remained in packing boxes; Darlington's scientific library, given to replace the one summarily and angrily removed by 1840, was largely unused. The herbarium, enriched by gifts of Rafinesque and Baldwin material,[34] has an international reputation and contains many type specimens.

By 1850, herbaria and botanical gardens were no longer as influential as they had been. Darlington's scientific stature rose continually and he still taught botany to classes of young women, but during the remainder of his life the Cabinet of Natural Science was a lost cause as a growing scientific institution. His subsequent preoccupation with the training of teachers and the cause of public education coincides with the interests manifested by his friend Jacob Bigelow, whose educational work evolved into the Massachusetts Institute of Technology. Certainly

32. The Library was that of the late William Cloud, M.D., son of Joseph Cloud, head of the U.S. Mint in Philadelphia.

33. Wilmer Worthington, M.D., one of William Darlington's last medical students, initiated this change. A leading organizer of county, state, and national medical societies, he was also involved in Pennsylvania politics, and was Speaker of the Senate in 1869.

34. From Elias Durand, who was the curator of the herbarium of the Academy of Natural Sciences in Philadelphia. A French-born Philadelphia druggist, he culled out from its great collections duplicates he sent home to France or gave to the Chester County Cabinet of Natural Sciences herbarium.

the creation of the West Chester State College rested on the bedrock of Darlington's interest in both ordinary and scientific education for the ordinary American.

In the 1840s Darlington was concerned also with the quality of botanical education in colleges. His remarks on the inadequacy and puffery of botany courses at many small colleges were accurate, but their publication was suppressed by Benjamin Silliman, editor of the *American Journal of the Sciences and Arts.*[35] Silliman did not want the outside world to be aware of any inadequacy among Americans; however, he arranged for Darlington to receive an honorary degree from Yale. Darlington received the same honor from Dickinson College also. At the time of his death he was a member of more than forty scientific societies—a remarkable feat for a physician-banker-botanist who lived in a village of a few thousand souls, a village that had no college or university to speak of; that merely had a wise, diligent, and botanically astute farming population.[36]

In the final years of his life Darlington wrote the two historical books that are considered the basis of his fame, the *Reliquiae Baldwinianiae* (1843) and *Memorials of Bartram and Marshall* (1849). He also created many genealogical documents and he helped Judge J. Smith Futhey to prepare a series of newspaper biographies titled *Notae Cestriensis.*

In 1837 he updated his publication of 1826, the *Florula Cestrica.* The second edition was titled *Flora Cestrica.*[37] In 1853 he again reworked his data, reclassifying and enlarging the material, which was full of interesting comments on medicine and economics. In craftmanship these volumes were superior to local floras prepared elsewhere. He wrote a simple listing of plants of nearby Lancaster County, based on the collections in Muhlenberg's herbarium, which had been deposited at

35. Benjamin Silliman—Asa Gray correspondence manuscript material in Asa Gray papers at the Library of the Gray Herbarium, Harvard University. See also John F. Fulton and Elizabeth H. Thomson, *Benjamin Silliman 1779–1864, Pathfinder in American Science* (New York: Schuman, 1947).

36. William Darlington, Listing of Society Memberships, manuscript, Rare Book Collection, Free Library of Philadelphia. (The author is indebted to Whitfield J. Bell, Jr., for knowledge of the Corvalho Calligraphic Collection and its holdings on Darlington.)

37. William Darlington, *Flora Cestrica. . .* (West Chester, Pa.: Siegfried, 1837). This compendium with numerous remarks on medical, agricultural, and social items is considered the acme of Darlington's botanical scholarship. It established him as a leading botanist.

the American Philosophical Society. The brief notes in Darlington's version were published in 1844 by Daniel Rupp in his *History of Lancaster County*.[38] Such lists, unaccompanied by descriptive terms, were then usual.

Darlington's work for Chester County was so extensive and well documented that it inspired repetition of the botanical survey years later.[39] As a result Chester County possesses such complete documentation of change in floral environment as few areas can boast. Darlington certainly inspired Ezra Michener, his fellow physician, to write a book on weeds when his own two editions for farmers, *Agricultural Botany* (1847) and *American Weeds and Useful Plants* (1859), written with George Thurber, were published.[40] George Thurber also contributed a third edition (1881) replete with additional illustrations.[41] Michener's delightful work did not have the wide circulation that Darlington-Thurber's three editions had enjoyed, but it is pungent and interesting. Thurber's illustrated editions of Darlington's original made for a very useful volume for farmers.

Thus it is evident that William Darlington was busy investigating in field, forest, and library in order to create new books on local botany and American botanical history, and to edit and rearrange older productions in the light of his medical, historical, and botanical knowledge. His life was remarkable, even though his fellow Cestrians never awarded him any of the public offices for which he had campaigned.[42] His national successes as United States Congressman from 1815 to 1822 were always due to the voters of Montgomery County. Yet he stayed active to the very end. He was much admired and beloved and left as his legacy the image of a superior physician who had become a world-famous botanist.

38. William Darlington, "A Catalogue of the Filicoid and Flowering Plants of Lancaster County, Penn., arranged in conformity with Endlicher's Genera Plantarum," in Daniel Rupp, ed., *History of Lancaster County, Pennsylvania* (Lancaster, 1844), pp. 483–507.

39. Hugh Stone, *The Flora of Chester County, Pennsylvania, with special reference to Flora Cestrica of William Darlington* (Philadelphia: Academy of Natural Sciences, 1943).

40. Ezra Michener, *Manual of Weeds. . .* (Philadelphia: King & Baird, 1878); William Darlington, *Agricultural Botany* (Philadelphia: Moore, 1847); William Darlington, *American Weeds and Useful Plants being a second and illustrated edition of Agricultural Botany*, ed. George Thurber (New York: Judd, 1859).

41. George Thurber, ed., *American Weeds and Useful Plants, being the Agricultural Botany of William Darlington* (New York: Judd, 1882).

42. William Darlington, diary begun in 1822, New-York Historical Society.

Indeed, many physician-botanists came to settle in the village of West Chester in order to be near him—men such as Edward Rivinus and Joseph Rothrock.[43]

A few months before he died, Evan Pugh, the true force behind the creation of Pennsylvania State University, wrote to him:[44]

> Agricultural College, Pa.
> September 1, 1862
>
> Venerable Friend:
>
> Your unexpected and very welcome letter took me by a very agreeable surprise today and I at once thank you for this exhibition of good feeling in our behalf. The two books both came on in due time and I shall place them on our shelves.
>
> I am sorry that no delegates from Chester County were present at our dedication but the deplorable state of things at Washington and on the Potomac is sufficient to explain their absence. We had not a very larger meeting but those who did come were men of chosen tenets and influence.
>
> Our school is getting on very well. It is more crowded than at any time since we opened and we are receiving more applications for next year than we have ever before at this season of the year.
>
> We still are encumbered with many financial difficulties but our way out of them is now getting clear.
>
> P.S. I send a copy of my agricultural investigation in English extracted from the Proceedings of the Royal Society and also a little history of our College.
>
> —Evan Pugh

P.O. Box 537
Paoli, PA 19301

43. Edward F. Rivinus, M.D. (1802–1873) was educated in Germany in medicine and in botany; he lived in West Chester, Pa., from 1839 to 1855. See Eli Kirk Price, *A Tribute to E. F. Rivinus, M.D.* (Philadelphia, 1873). Joseph Rothrock, M.D. (1839–1923), father of Pennsylvania forestry and popularizer of the outdoor cure for tuberculosis, became professor of botany at the University of Pennsylvania School of Medicine. See Susan Dudley and David R. Goddard, "Joseph T. Rothrock and Forest Conservation," *Proceedings of the American Philosophical Society*, 117 (1973): 37–39.

44. Rare Book Collection, Pattee Library, Pennsylvania State University, Charles Mann, librarian.

Agricultural Statistics in the United States, 1856

RECENTLY the United States has produced more exact and more extensive information than perhaps any other complex of countries. With the Yankee the "almighty dollar" peeps out even in this activity. With scientific enterprises which do not hold a promise of immediate material usefulness—for example measurements of altitude made merely for the advancement of topographic knowledge—he concerns himself little or not at all. In Germany a range of mountains like the Alleghenies would entice hundreds of barometer readers and travellers, who would leave no mountain-top or valley or halting-place untraversed. A scientific connoisseur of this kind scarcely exists in the United States of North America. On the other hand the Americans distinguish themselves in all large and generally useful works and investigations such as the measurement of coasts and oceans, the determination of levels for roads and railroads, agricultural statistics, etc.

Agricultural statistics in particular are developed in such a practical form and to such an extraordinary effective and extensive degree as to deserve special mention and a recommendation for imitation in our own country.

A. Petermann and E. Behm, *Die Verbreitung der Hauptsächlichsten Kultur-Produkte in der Vereinigten Staaten von Nord-Amerika. Petermanns Geographische Mittheilungen* 2 (1856): 408–39.

Translated by the editorial staff of *Transactions and Studies.*

William Darlington, M.D. (1782–1863) His Predecessors and Contemporaries in the Development of a Scientific Agriculture*

EUGENE H. CONNER and MARY L. CONNER

THE latter half of the 18th century was a time of great activity in the western world of science. Order was developing in the disciplines of botany, chemistry, natural history, and even to some extent in medicine. The naive and fanciful accounts of the natural marvels discovered in the expanding world of the 17th and early 18th centuries were decreasing. The efforts of Carl von Linné, M.D. (1707–1778) and others to establish order in botanical studies encouraged other natural philosophers and physicians to develop orderly systems of classification for other aspects of man's natural surroundings. Chemical phenomena progressed to the recognition of specific actions of chemicals and drugs. New philosophers, using the experimental method, sought to unravel mysteries and apply their new-found knowledge more precisely to medicine, agriculture, manufacturing, and the service of man.

Medicine, botany, and chemistry developed rapidly after 1750. The classification of plants, animals, diseases of man, and chemical affinities had brought order which facilitated understanding in the world of wonders. These classification systems were debated, adopted, altered, and superseded by others during the tumultuous times of the industrial, the American, and the French Revolutions.

The growing tide of immigrants from western Europe and industrial development in America drastically increased the need for food in cities. The subsequent growth of population in the late 18th century made land increasingly valuable, and some productive family farms became land for new homes.

Before the advent of scientific farm practices (and farm machinery), the farmer had only one way to increase the yield of his crops: he cleared more forest and planted new fields. The old ones ran to weeds and brush. This extravagant practice supplied abundant species of

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Transactions & Studies of the College of Physicians of Philadelphia ser. 5, vol. 5, no. 1 (1983): 43–66.

weed seeds and created serious problems in cultivated fields, roadsides, and watercourses. Poor farm practices associated with the clearing of new lands contributed to erosion, rapid loss of topsoil, and only an evanescent increase in crops.

Farming, with its associated disciplines, was the primary occupation in the United States until the years immediately preceding the Civil War. Pennsylvania's proprietor, William Penn, had great interest in agricultural improvements and encouraged his people in these endeavors. He imported well-bred horses and experimented with the cultivation of grass.[1] The first scientific agriculturist in North America was Penn's secretary, James Logan (1674–1751), who came to Philadelphia in 1699. His experiments proved that pollen falling from the tassel of corn onto the silk fertilized the ova and thus produced the grain; this marked the beginning of scientific agriculture.[2]

Philadelphia was the largest and most prosperous community in North America. The intellectual, business, and philanthropic activities of its citizens were nurtured and directly influenced by its Quaker community. It was a natural place for the institutional development of medicine, chemistry, botany, and agriculture.

Wealth, leisure, intellectual maturity, and a degree of curiosity are essential for the development of cultural refinements. The refinements with which we are concerned here have to do with the development of the sciences, and consist of the establishment and operation of schools, colleges, medical schools, and specialized societies.

Under the direction of Benjamin Franklin, around mid-century, five institutions were established that had a profound influence on Philadelphia's intellectual growth and early supremacy: The Library Company of Philadelphia (1731), the American Philosophical Society (1743), The Pennsylvania Hospital (1751), the College of Philadelphia (1740), and its Medical College (1765). The influence of these institutions diffused

1. Lyman Carrier, *The Beginnings of Agriculture in America* (New York: McGraw-Hill, 1923), p. 176.

2. James Logan, colonial statesman and scholar, completed the manor house, Stenton, of his country estate near Germantown in 1730. He returned there to study and farm. The home and outbuildings have been preserved. There Logan in 1735 conducted his experiments on maize which were published in Leyden (1739) and in English in London (1747).

into the adjacent countryside, including the counties of Philadelphia, Bucks, Montgomery, Chester, and Delaware in Pennsylvania and to some extent New Castle County, Delaware.

After the Revolution, as men's minds could be devoted once again to the advancement of learning, a number of societies serving special interests were formed in the intellectually fertile geographic area that extended south and west from Philadelphia. Some of these societies were: Philadelphia Society for Promoting Agriculture (1785),[3] Philadelphia County Society for Promoting Agriculture (1788),[4] The Chemical Society (1789),[5] Company for the Improvement of the Vine (1802),[6] American Board of Agriculture (1803),[7] The Linnean Society (1806),[8]

3. Founded by John Beale Bordley, lawyer and agriculturalist who served as its vice president (1785–93); Richard Peters, lawyer and jurist (president, 1805–28); George Clymer, merchant, signer of the Declaration of Independence and Congressman; and Samuel Powell, merchant (president, 1785–93). A number of physicians were members in 1785: Adam Kuhn, Benjamin Rush, John Jones, and George Logan. The Society was dominated by Federalists (especially Peters and Clymer). Political animosities plus the disruption occasioned by the yellow fever epidemic of 1793 resulted in a suspension of activities from 1794 until the group was reorganized in April 1805. The Society is still active and flourishing. See *Memoirs of the Philadelphia Society for Promoting Agriculture* 1–3 (1808, 1811, 1814); Rodney H. True, "Sketch of the History of the Philadelphia Society for Promoting Agriculture," *Memoirs of the Philadelphia Society for Promoting Agriculture*, 6 (1939): 5–24; Olive Moore Gambrill,"John Beale Bordley and the Early Years of the Philadelphia Society for Promoting Agriculture," *Pennsylvania Magazine of History and Biography* 66 (1942): 410–39.

4. Founded at Stenton in 1788 by George Logan and his neighbors. See Frederick B. Tolles, *George Logan of Philadelphia* (New York: Oxford University Press, 1953), pp. 88–89.

5. Founded by John Pennington, M.D. See W.D. Miles, "Benjamin Rush, Chemist," *Chymia* 4 (1953): 37–77. Other sources attribute its beginnings to James Woodhouse in 1792. See Edgar Fahs Smith, *Chemistry in America* (New York: D. Appleton, 1914), p. 12.

6. Benjamin Say was its first president; Issac Norris its treasurer. Jared Ingersoll, John Vaughan, James Mease, Fred Heiss, and Elisha Fisher were managers. In Harry B. Weiss and Grace M. Ziegler, *Thomas Say, Naturalist* (Springfield, Ill.: Thomas, 1931), pp. 24–26. The company had a vineyard of 3,000 plants in "the center of the ground plan of Philadelphia, on the line with Cherry Alley." In William S. Middleton, "James Mease,"*Annals of Medical History* 7 (1925): 23.

7. Issac Briggs, Secretary of the Board published an "Address. . . to the Citizens of the United States" in *Medical Repository* 6 (1803): 465–69. This address does not list the members of the board. James Madison, while Secretary of State and known as "the best farmer in Virginia," became the first president of the Board, which was an association of farm groups established in Washington [D.C.]. See Richard Beale Davis, *Intellectual Life in Jefferson's Virginia* (Chapel Hill: University of North Carolina Press, 1964), p. 161.

8. James Mease, *The Picture of Philadelphia* (Philadelphia: Kite, 1811), pp. 303–5.

Cattle Society (1809),[9] Pennsylvania Agriculture Society (1822),[10] Pennsylvania Horticulture Society (1827),[11] and the Academy of Natural Sciences (1812).[12] Physicians played major roles in such societies and, with men from other professions and trades, guided them in making practical improvements in farm practices. Through these societies some of the objections to "book farming" were gradually overcome. Soon topics on agriculture and its related specialty sciences began to appear in the newspapers and early magazines of the Republic.

Early medical journals also served the biological and physical sciences and thereby supplemented the *Transactions of the American Philosophical Society* and the *Memoirs of the American Academy of Arts and Sciences*. They were: *The Medical Repository*, New York (1797–1824), edited by Samuel L. Mitchill, Edward Miller, and Elihu H. Smith; *The Philadelphia Medical Museum* (1804–1811), edited by John Redman Coxe; *Philadelphia Medical and Physical Journal* (1804–1809), edited by Benjamin Smith Barton; *Medical and Agricultural Register* (1806–1808), edited by Daniel Adams. Each of these periodicals contained abstracts of transactions of various societies, including reviews and observations relating to botany, horticulture, agriculture, paleontology, chemistry, mineralogy, meterology, and medical topography, as well as medicine and surgery.[13] *The Medical and Agricultural Register* contained more about agriculture and cottage industries than about medicine. James Mease published *Archives of Useful Knowledge*, 1811–1813, which completed three volumes.

9. Established in order to improve the breed of cattle in Pennsylvania. Lawrence Seckel was its first president. See Mease, pp. 266–67.

10. Originally organized in January 1794, its proponents were unable to obtain a charter. A revived effort in October 1822 was successful and it was incorporated in 1823. No physicians were founding members. See *Memoirs of the Pennsylvania Agricultural Society, 1823–1824* (Baltimore: Skinner, 1824), pp. v–ix.

11. Nathaniel Chapman and James Mease were elected as two of the society's four vice-presidents.

12. The Academy was organized in the drugstore of John Speakman, Jr. Horace Mather Lippincott, *Early Philadelphia, its People, Life and Progress* (Philadelphia: Lippincott Co., 1917), p. 42. This society owes its success indirectly to William Bartram, through his influence on Dr. Joseph Gilliams, a dentist who became comptroller of the Academy in 1812 and in 1815 provided its first permanent quarters. Joseph Ewan, ed., *William Bartram, Botanical and Zoological Drawings, 1756–1788* (Philadelphia: American Philosophical Society, 1968), pp. 8 & 42.

13. M. Ebert, "The Rise and Development of the American Medical Periodical, 1797–1850," *Bulletin of the Medical Library Association* 4 (1952): 243–76.

It contained information on animal husbandry, control of insect pests in agriculture, manures, farm implements, and veterinary problems. Publications specifically dedicated to the biological and physical sciences did not appear until later. They were *Proceedings of the Philadelphia Academy of Natural Sciences*, begun in 1817, and Benjamin Silliman's *American Journal of Science and Art*, begun in 1818.

Several physicians who preceded Darlington made outstanding contributions to the devlopment of scientific agriculture. In a previous study on this topic, the role of the physician-chemist in the advancement of agriculture was addressed.[14] Here we shall consider the work of some physicians who were, in fact, agriculturists.

George Logan (1753–1821)[15] of Stenton, Philadelphia County, was the most active experimental agriculturist in the Philadelphia area. He had received part of his early classical education in England and trained in medicine in Edinburgh, receiving the M.D. in 1779. Fortunately, for our consideration, he inherited Stenton, a 500-acre estate of his grandfather and father. He had inherited also his grandfather's large diversified library and the medical library of his older brother, William Jr. These are the physical aspects of his inheritance, but more important were those related to his genetic origins and family tradition—a love and respect for the soil. His grandfather, James Logan, was the earliest agriculture experimenter in the colonies. His father, William Logan, was a first-rate farmer, widely read and well acquainted with new agricultural practices, who had kept a careful journal of his farm.[16]

While in Scotland, Logan attended the lectures on botany by John Hope[17] during 1777–1778. After the close of school in the spring of 1778, he toured Scotland and visited the farm of Robert Barclay at Ury, where he examined the progress and results of agricultural experiments. He returned to Philadelphia and practiced medicine briefly, but in 1783

14. Eugene H. Conner, "Physicians and the Development of Scientific Agriculture, Empiricism to Science, 1731–1863," *Transactions and Studies of the College of Physicians of Philadelphia* ser. 4, 45 (1978): 316–335.

15. Deborah Norris Logan, *Memoirs of Dr. George Logan of Stenton*, ed. by Frances A. Logan (Philadelphia: Historical Society of Pennsylvania, 1899).

16. The original manuscript notebooks "Memoranda in Husbandry on my Own Plantation," are in the library of the U. S. Department of Agriculture, Washington, D.C.

17. John Hope was Professor of Medicine and Botany at Edinburgh from 1761 to 1786. John Dixon Comrie, *History of Scottish Medicine to 1860* (London: Baillière, Tindall & Cox, 1927), pp. 184–85.

decided to devote his full attention to the repair of the family estate and to become a full-time scientific farmer. At the formation of the Philadelphia Society for Promoting Agriculture, George Logan was there with a number of new aristocrats, staunch Federalists whom he had known all his life. These gentlemen, unlike Logan, were not farmers; because of their contempt for Republican simplicity and their political betrayal of the farmer,[18] Logan sought other means to teach scientific agriculture. He published the results of his agricultural experiments in pamphlets, newspapers, and magazines.[19] These efforts were intended to help overcome the "dirt" farmers' antipathy to education and to call to attention innovations that promised better crops, better livestock, and a better life. In 1788 Logan founded the Philadelphia County Society for Promoting Agriculture, and he assured its devotion to "dirt" farmers by providing in its constitution that "no man shall be eligible as a member but a farmer."[20]

During his service as a member of the Pennsylvania House of Representatives and as a United States Senator (1801–1807), he represented the farmer honestly and defended his causes conscientiously.[21]

Logan was extremely practical in his suggestions for improvement, e.g., he attempted to interest farmers in using oxen in preference to horses, he recommended the use of corn stalks as nutritious provender, and he showed that profits would be increased if better care were taken of young calves and lambs.[22]

One other important aspect of Dr. Logan's husbandry was his interest in beekeeping. It was the general practice in the 18th century to kill bees before taking their honey. This offended Logan, for he had read that it was possible to take the honey without destroying the

18. Dr. Logan believed that the Federalists betrayed the farmer when they voted in support of matters which favored foreign products in preference to local. He especially opposed Alexander Hamilton and his report on public credit, which Logan thought surrendered the government to the city merchants. Tolles, p. 109.

19. George Logan, *Fourteen Agricultural Experiments to Ascertain the Best Rotation of Crops; Addressed to the "Philadelphia Agricultural Society"* (Philadelphia: F & R Bailey, 1797); idem, *A Letter to the Citizens of Pennsylvania, on the Necessity of Promoting Agriculture, Manufacturers, and the Useful Arts*, 2nd ed. (Philadelphia: Patterson & Cochran, 1800).

20. Published in *American Museum* 5 (1789): 161–63.

21. [J. L. Harrison], *Biographical Directory of the American Congress 1774–1949* (Washington: U. S. Government Printing Office, 1950), pp. 1471–72.

22. The account of caring for calves appeared in *American Museum* 6 (1789): 102–3; the account of use of corn stalks, ibid., 9 (1792), p. 172.

swarm.[23] He knew, of course, that beekeeping was also important for assured pollination. Other physician contemporaries, Rev. Joseph Doddridge, James Thacher, Benjamin Smith Barton, and John Coakley Lettsom, wrote about bees and beekeeping.[24] Dr. Logan's model farm at Stenton was widely known by serious, knowledgeable farmers from other states who, as representatives of their fellow citizens, gathered in Philadelphia in 1790–1800, when it was the seat of the national government. Even George Washington once paid a visit to Stenton after his retirement (July 1, 1787) while he was attending the Constitutional Convention in Philadelphia.[25]

Thomas Jefferson, while Secretary of State in Washington's cabinet, frequently sought refuge and relief from the Federalists by visiting at Stenton.[26] He was delighted with Logan's improved plow, the mould board of which was nearly identical to one of his own design. Jefferson ordered one made and had it sent to his fellow farmer and neighbor, James Madison, "the best farmer in Virginia." There were other Republicans who escaped to Stenton: David Rittenhouse; Alexander James Dallas; Benjamin F. Bache, editor of the *General Advertiser*; and Dr. James Hutchinson, trustee of the University of the State of Pennsylvania, Professor of Materia Medica there and subsequently Professor of Chemistry.[27]

James Mease (Fig. 1), a graduate of the University of Pennsylvania Medical Department, was resident physician of the Health Office of Philadelphia from 1794 to 1798. After being gravely ill with yellow fever in 1793 and—allegedly—again in 1798, he seems to have devoted his attention to writing in the natural sciences, especially geology and agriculture.[28]

23. Tolles, p. 93.

24. Reverend Joseph Doddridge, *A Treatise on the Culture of Bees* (St. Clairsville, Ohio: Armstrong, 1813); James Thacher, *A Practical Treatise on the Management of Bees* (Boston: Marsh & Capen, 1829); Benjamin Smith Barton, "An Inquiry into the Question Whether the *Apis mellifica* or true Honey Bee, is a native of America," *Transactions of the American Philosophical Society* 3 (1793): 241–60; John Coakley Lettsom, *Hints Designed to Promote Beneficience, Temperance and Medical Science* (London: Manman, 1801; this "hint" concerning beekeeping does not appear in every copy of the collection.); James Johnston Abraham, *Lettsom, His Life, Times, Friends and Descendants* (London: Heinemann, 1933), pp. 311–12.

25. Deborah Norris Logan, pp. 44–45; Tolles, p. 98.

26. Deborah Norris Logan, p. 50; Tolles, pp. 123–24.

27. Tolles, pp. 123–24.

28. Middleton, p. 23.

Figure 1. James Mease, from original lithograph of a portrait by M. R. (not identified). From the Historical Collections of the College of Physicians of Philadelphia.

Mease became one of the managers of the Company for the Improvement of the Vine, which had some 3,000 vines. In 1803–4 Mease edited, with additions, a five-volume American edition of *Willich's Domestic Encyclopedia.*[29] Several years later he produced *A Geological Account of the United States* (1807). In 1811 he became the Secretary of the

29. James Mease, *The Domestic Encyclopedia*, 1st American ed. (Philadelphia: Willich, 1804).

Philadelphia Society for Promoting Agriculture and contributed numerous papers to its *Memoirs*,[30] which he edited intermittently. At this same time he launched his *Archives of Useful Knowledge*, and completed three volumes in 1813.[31] He was knowledgeable in several subjects related to agriculture, with extensive practical experience as a breeder of sheep and a dresser of vines. In 1827 he became one of the vice-presidents of the Horticulture Society. He gave several lectures to the Philadelphia Society for Promoting Agriculture.[32] His contributions to agriculture were outstanding and his wide scope added to the quality and usefulness of the *Memoirs*. He was a physician-agriculturalist of the first order although there is no record of his being a "plain dirt" farmer. Mease's future in medicine and science were correctly predicted by his professor, Benjamin Rush, in a letter dated 28 May 1792: "You may safely inform the public that the author is a young man of uncommon talents, and bids fair to do equal honor to medicine and to his country."[33]

Benjamin Say was another physician who served in the State Senate of Pennsylvania and the United States Congress. His main interest was in viticulture and he was an organizer and the first president of the Company for the Cultivation of the Vine. He was also a member of the Philadelphia Society for Promoting Agriculture and the Linnean Society. His country estate at Cliffs on the Schuylkill was adjacent to Gray's Ferry.[34]

These are but a few of William Darlington's predecessors who labored in the advancement of agriculture and who influenced him directly.

30. *The Memoirs of the Philadelphia Society for Promoting Agriculture,* Volume 1, was issued in two variant forms, with differences in pagination, in 1808 and 1815. Copies of Volume 3 are dated 1811 and 1814.

31. James Mease, *Archives of Useful Knowledge* (Philadelphia: David Hogan, 1811). Only two further volumes were published (1812 and 1813).

32. James Mease, Introductory Lecture at the Philadelphia Society for Promoting Agriculture, 1813: "Upon Comparative Anatomy and the Diseases of Domestic Animals," *Memoirs of the Philadelphia Society for Promoting Agriculture* 3 (1814): xix–lxix; idem, *An Address on the progress of agriculture with hints for its improvement in the United States* (Philadelphia: Philadelphia Society for Promoting Agriculture, 1817).

33. Middleton, p. 26, note 19, a copy of a letter from Benjamin Rush to Dr. John Coakley Lettsom, London, 28 May 1792.

34. Howard A. Kelly and Walter L. Burrage, *American Medical Biographies* (Baltimore: Norman, Remington Co., 1920), p. 1020; Weiss and Ziegler, pp. 17–26.

Darlington was born on a 300-acre farm near Dilworth in Birmingham Township, Chester County, Pennsylvania. He was the eldest of five sons and two daughters born to Edward and Hannah Townsend Darlington.[35] Although small of stature and somewhat frail as a child, Darlington worked on the family farm and became acquainted with the labor, problems, frustrations, and rewards of farming. After receiving the rudiments of an education in nearby common schools, he persuaded his father to allow him to study medicine under John Vaughan, who then practiced in Wilmington, Delaware.[36]

What motivated Darlington is not known, but the study of medicine was the only formal education in the sciences available at that time, and it did afford sound preparation for other scientific work.

It was perhaps under the tutelage of John Vaughan, during the years 1800–1802, that Darlington was first exposed to the pervasive influence of Philadelphia's great institutions of learning. Dr. Vaughan had attended a course of medical lectures at the University of Pennsylvania in 1793–94 following his apprenticeship to Dr. William Currie.[37] Currie also had been trained in Philadelphia at the Medical School of the College of Philadelphia. As a member of the Philosophical Society of Delaware, Vaughan had presented a course of lectures on chemistry and natural philosophy in Wilmington during the winter of 1799–1800. Darlington's preceptor was an active member of the Medical Society of Delaware and it is quite likely that his apprentice attended the meetings. Here Darlington probably met James Tilton, one of the founders and long-time president of the Medical Society of Delaware. Dr. Tilton was not only a skilled physician and military surgeon but also an excellent chemist and an able horticulturist. One may wonder how often Dr. Darlington visited this venerable patriot, who resided only 15 miles

35. Washington Townsend, *Memorial of William Darlington, M.D.* (West Chester, Pa.: James, 1863).

36. Kelly and Burrage, pp. 1180–1181; James Thacher, *American Medical Biography* (Boston, 1828; reissued New York: Milford House, 1967), pp. 154–56.

37. William Currie, a native of Chester County, Pa., was apprenticed to John Kearsley and attended medical lectures in Philadelphia. He served as a surgeon in the Continental Army during the Revolutionary War and afterwards practiced in Chester, Pa. He moved to Philadelphia in the early 1790s and continued to practice until 1816. Kelly and Burrage, p. 267.

away. Most certainly, Darlington would have been acquainted with Dr. Tilton's published papers.[38]

Another member of the Medical Society of Delaware and one of its founders was Edward Miller of Dover, Delaware.[39] Miller was a graduate in medicine from the College of Philadelphia (1784). Darlington probably did not meet Miller during his years of apprenticeship but he was acquainted with Miller's talents and with the fact that Miller was one of the founders and editors of the first medical journal in the United States, *The Medical Repository* (Fig. 2).[40]

Having had the good fortune to be with Dr. Vaughan during the formative years of the Medical Society and of the Philosophical Society of Delaware, Darlington early in his professional experience came to appreciate the importance of the physician's continuing education in the sciences as well as in medicine. It was from his exposure to this form of institutionalized education that he went to Philadelphia to attend medical lectures.

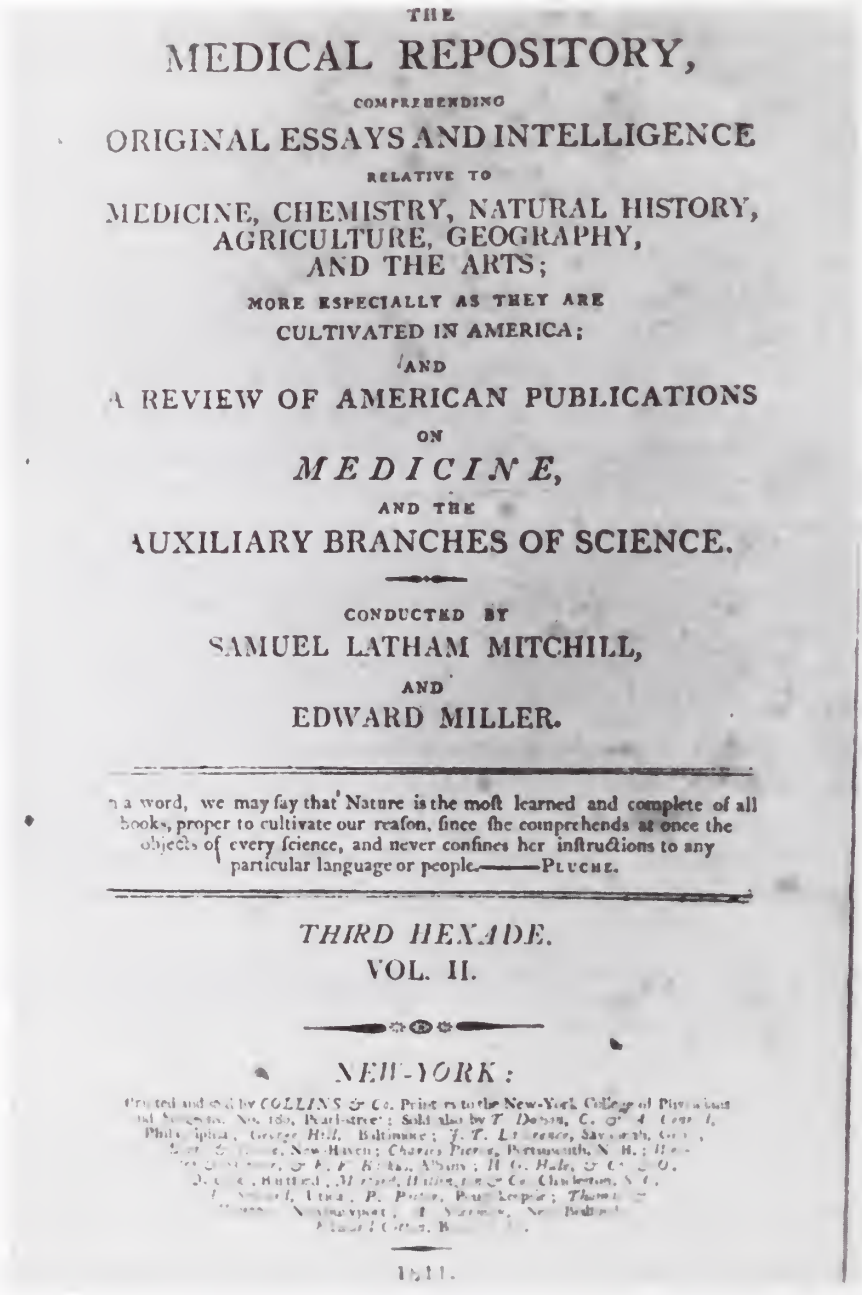
When Darlington arrived in Philadelphia in the fall of 1802, the city was still the most populous and prosperous in the United States. Although it was no longer the seat of the national government, it remained the cultural center of the country. The University of Pennsylvania Medical Department had a famous and capable faculty: William Shippen, Jr., Professor of Anatomy, Surgery, and Midwifery; Caspar Wistar, Adjunct Professor of Anatomy and Surgery; Benjamin Rush, Professor of Theory and Practice and of the Institutes of Medicine; James Woodhouse, Professor of Chemistry; and Benjamin Smith Barton, Professor of Materia Medica, Natural History, and Botany.[41]

38. James Tilton, "Answers to Queries on the State of Husbandry in the Delaware State," *Columbian Magazine* 5 (1790); idem, "Observations on the propriety of a Farmer living on the produce of his own land," *Memoirs of the Philadelphia Society for Promoting Agriculture* 3 (1814): 142–50; Thacher, pp. 129–41.

39. Edward Miller was born in Delaware in 1760. He began medical studies under Dr. Charles Ridgely of Dover, and attended medical lectures at the College of Philadelphia. After receiving the M.D. in 1789 he practiced in Frederica, Delaware. In 1807 he became Professor of the Practice of Physic at the College of Physicians and Surgeons of New York. Appointed physician to the New York Hospital (1809), he served until his death in March 1812. Thacher, pp. 385–92.

40. *The Medical Repository* first appeared on 26 July 1797 and was edited by Samuel Latham Mitchill, Edward Miller, and Elihu Hubbard Smith. The journal went through 23 volumes and ceased publication in 1824.

41. Francis R. Packard, *History of Medicine in the United States* (New York: Hoeber, 1931), pp. 373–77.



THE

MEDICAL REPOSITORY,

COMPREHENDING

ORIGINAL ESSAYS AND INTELLIGENCE

RELATIVE TO

MEDICINE, CHEMISTRY, NATURAL HISTORY,
AGRICULTURE, GEOGRAPHY,
AND THE ARTS;

MORE ESPECIALLY AS THEY ARE
CULTIVATED IN AMERICA;

AND

A REVIEW OF AMERICAN PUBLICATIONS

ON

MEDICINE,

AND THE

AUXILIARY BRANCHES OF SCIENCE.

CONDUCTED BY

SAMUEL LATHAM MITCHILL,

AND

EDWARD MILLER.

In a word, we may say that Nature is the moſt learned and complete of all books, proper to cultivate our reaſon, ſince ſhe comprehends at once the objects of every ſcience, and never confines her inſtructions to any particular language or people.——PLUCHE.

THIRD HEXADE.

VOL. II.

NEW-YORK:

Printed and ſold by COLLINS & Co. Printers to the New-York College of Physicians and Surgeons, No. 189, Pearl-ſtreet; Sold alſo by T. Dobſon, C. & A. Conrad, Philadelphia, George Hill, Baltimore; J. T. Lawrence, Savannah, Geo., [illegible], New-Haven; Charles Peirce, Portſmouth, N. H.; [illegible], & E. F. Backus, Albany; H. C. Hale, & Co. [illegible], Hartford, Merrill, Hilliard & Co. Charleſton, S. C., [illegible], Utica, P. Potter, Poughkeepſie; Thomas [illegible], Newburyport, [illegible], New-Bedford, [illegible], Boſton.

1811.

Figure 2. Title page of *The Medical Repository* with expanded title including "Agriculture." This format first appeared in 1808.

Several members of this faculty contributed to the advancement of scientific and practical agriculture.

Benjamin Smith Barton (Fig. 3) had great influence on the development of scientific botany. Darlington in his "Progress of Botany in North America" pays tribute to his professor:[42]

> In the [same] year (1803), the first American *elementary* work on Botany was published, at Philadelphia, by the late Prof. B. S. Barton. Though somewhat diffuse, it was an useful and respectable performance. Prof. Barton, in those days, occasionally gave courses of *Lectures* on Natural History and Botany, to small classes in the University of Pennsylvania (one of which courses, in 1803–4, the writer had the privilege of attending); and there can be no doubt that he did more than any of his contemporaries, in diffusing a taste for the natural sciences, among the young men who then resorted to that school.

Figure 3. Portrait of Benjamin Smith Barton, from the collections of The American Philosophical Society, Philadelphia.

42. William Darlington, *Memorials of John Bartram and Humphry Marshall* (Philadelphia: Lindsay & Blakiston, 1849), p. 24. He refers to Benjamin Smith Barton's *Elements of Botany* (Philadelphia, 1803).

Apparently Professor Barton presented one set of lectures on materia medica and another on natural history during the regular school year. The lectures on botany were given in the spring and summer.[43] These courses, at first elective,[44] became the most popular in the medical school. William P. C. Barton, the professor's nephew and biographer, observes that "the field of natural history and botany was virtually fallow in America."[45] Professor Barton utilized Bartram's garden as a living laboratory for his own instruction and that of his students.

Barton devoted much time and effort toward compiling a vegetable materia medica of the United States. He began the work soon after he succeeded Samuel P. Griffitts[46] as Professor of Materia Medica at the Medical School of the University of Pennsylvania. In an address given in 1798 before the Philadelphia Medical Society (the student-faculty medical society at the University), he first used the title "Collection for an Essay Towards a Materia Medica of the United States." Barton continued to add to this essay, producing editions and supplements until his death. It remained for his nephew, William P. C. Barton, to complete the work.

Barton was an active participant in the affairs of the American Philosophical Society, to which he had been elected in 1789. He served the Society in a number of capacities, including that of vice-president (1802–1815). Some of his contributions to the literature appear in the publications of that Society.

In the dissemination of information contributing to the growth of the natural sciences, botany, agriculture, and medicine, he deserves

43. Benjamin Smith Barton, *Collections for an Essay towards a Materia Medica of the United States, Part Second*, 3rd ed. (Philadelphia: Earle & Co., 1810), p. 54.

44. William S. Middleton, "Benjamin Smith Barton," *Annals of Medical History* n.s. 8 (1936): 477–91.

45. William P. C. Barton, "An Account of the Life of Benjamin Smith Barton," *Port Folio* 1 no. 4 (1816).

46. Samuel Powel Griffitts was educated at the College of Philadelphia. He studied medicine under Adam Kuhn and received the M.D. in 1781 from the University of Pennsylvania. In 1786 he established The Philadelphia Dispensary, which he managed successfully for the next forty years. He was Professor of Materia Medica at the University of Pennsylvania Medical Department from 1792 to 1796. He assisted in the preparation of the U.S. Pharmacopoeia. Kelly and Burrage, pp. 468–69.

special commendation for founding and editing *The Philadelphia Medical and Physical Journal*.[47] The journal's contents, somewhat bewildering in their variety, reflected Barton's catholic interest in the sciences as well as his zeal for bringing new findings before the medical and scientific community. Barton probably envisioned that the science of botany, by providing a complete vegetable materia medica, would eventually supply cures for the ills of man and beast. Likewise, by equal diligence, botany, the parent of the agricultural sciences, could assure variety and abundance of food for all mankind.

Barton was not only an enthusiastic teacher but also a generous supporter of all who were interested students of botany. He "discovered," taught, and helped support Thomas Nuttall,[48] and he and other members of the botanical community nurtured Frederick Pursh, the able gardener of William Hamilton's "Woodlands" near Philadelphia in his botanical studies.[49]

The Linnean Society of Philadelphia was another institution which fostered medical and agricultural botany. Established first as the American Botanical Society, it changed its name to The Linnean Society. Barton was elected its first president. The group was described as follows by James Mease:

47. This was the third medical journal to be published in the United States. It appeared irregularly from November 1804 until May 1809.

48. Thomas Nuttall immigrated to Philadelphia in 1808 as a young printer from Yorkshire, England. Benjamin Smith Barton together with José Francisco Correa da Serra and Zaccheus Collins financed several of Nuttall's collecting expeditions to the western parts of North America. Curator of the Botanical Garden, Harvard University (1822–1832), Nuttall was later sent with J. K. Townsend by the American Philosophical Society and the Academy of Natural Sciences of Philadelphia to join the expedition under Captain N. J. Wyeth to the Rocky Mountains and the Columbia River (1834–35). He published *The Genera of North American Plants* (Philadelphia, 1818), *A Manual of Ornithology* (Cambridge, Ma.: Hilliard and Brown, 1832), and numerous papers in scientific journals. A competent botanist and ornithologist, he also made valuable contributions to the geology of the Mississippi Valley. Witmer Stone, in *Dictionary of American Biography*, ed. Dumas Malone (New York: Scribner's, 1934), vol. 13, pp. 596–597; Joseph Ewan, *Rocky Mountain Naturalists* (Denver: University of Denver Press, 1950), p. 273; Middleton, "Benjamin Smith Barton," p. 481.

49. Frederick Pursh came to the United States from Saxony in 1799. He was employed in Philadelphia first as a gardener. His journeys of botanical exploration (1806, 1807) were financed by Benjamin Smith Barton. Pursh published the first complete flora of America north of Mexico: *Flora Americae Septentrionalis* (London: White, Cochrane & Co., 1814). Middleton, "Benjamin Smith Barton," p. 481.

> A number of young gentlemen, desirous to promote a knowledge of the vegetable kingdom; and assured of the advantages to be derived from it, in a philosophical, medical and agricultural point of view met together and established a society, on the 6th of June 1806,. . . ."[50]

Barton delivered the first anniversary oration in June 1807 (Fig. 4).[51]

Plagued by ill health—probably pulmonary tuberculosis and gout—Barton occasionally could not meet his lecture schedule. Fortunately, the able botanist and diplomat, José Francisco Correa da Serra,[52] substituted for him.

Benjamin Rush was probably the most famous member of the medical faculty.[53] Darlington, when he took his place as a student, certainly knew of some of Rush's interests and acomplishments. By the time Darlington was to defend his medical thesis, Rush complimented him on his successful "application of Metaphysics to the Practice of Physic,"[54] and recommended his approval for graduation.

50. Mease, *The Picture of Philadelphia*, p. 303.

51. Benjamin Smith Barton, *A Discourse on Some Principal Desiderata in Natural History* (Philadelphia: Denham & Town, 1807).

52. Abbé Correa da Serra, Portuguese Minister Plenipotentiary to the United States, lived in Philadelphia from 1815 to 1820. He was an able botanist and in the late spring of 1816 gave Barton's lectures at the University. Using Henry Muhlenberg's *Catalogus Plantarum Americae Septentrionalis* (1816), he prepared a new arrangement based upon the "natural system" of Jussieu. This may have been the earliest use of this modern system of arrangement in botanical lectures in America. Jeannette E. Graustein, *Thomas Nuttall, Naturalist* (Cambridge: Harvard University Press, 1967), pp. 95 & 122; Richard B. Davis, "The Abbé Correa in America, 1812–1820," *Transactions of the American Philosophical Society* n.s. 45 (1955): 87–197.

53. Benjamin Rush, one of the five physician-signers of the Declaration of Independence, was an active and articulate practitioner. He was well known to the general public for the controversies which appeared in the public press concerning his actions as a medical educator, politician, and hospital administrator during the Revolutionary War and as a vigorous bleeder and purger during the yellow fever epidemics in Philadelphia, especially the first in 1792. He served on the faculty of the Medical College in Philadelphia as Professor of Chemistry, Professor of Institutes and Theory and Practice of Medicine, and Professor of Clinical Medicine; he made outstanding contributions to military medicine and the treatment of the insane. George Washington Corner, ed., *The Autobiography of Benjamin Rush* (Princeton: Princeton University Press, 1948); Nathan G. Goodman, *Benjamin Rush, Physician and Citizen, 1746–1813* (Philadelphia: University of Pennsylvania Press, 1934).

54. Lyman Henry Butterfield, ed., *Letters of Benjamin Rush* (Princeton: Princeton University Press, 1951), p. 884, note 7. This quotation appears in Darlington's own copy of his thesis, *A Dissertation on the Mutual Influence of Habits and Disease* (Philadelphia: Rakestraw, 1804).

A

DISCOURSE

ON

SOME OF THE PRINCIPAL DESIDERATA

IN

NATURAL HISTORY,

AND ON

THE BEST MEANS OF PROMOTING THE STUDY

OF THIS

SCIENCE,

IN THE UNITED-STATES.

READ BEFORE THE PHILADELPHIA LINNEAN SOCIETY,
ON THE TENTH OF JUNE, 1807.

BY BENJAMIN SMITH BARTON, M. D.,

PRESIDENT OF THE SOCIETY; ONE OF THE VICE-PRESIDENTS OF THE AMERICAN PHILOSOPHICAL SOCIETY; AND PROFESSOR OF MATERIA MEDICA, NATURAL HISTORY AND BOTANY, IN THE UNIVERSITY OF PENNSYLVANIA.

Philadelphia:
PRINTED BY DENHAM & TOWN,
No. 278, *South Second-street.*

1807.

Figure 4. Title page of Barton's address to The Linnean Society delivered in Philadelphia, 10 June 1807. Original in the Historical Collections of The College of Physicians of Philadelphia.

Although a city dweller, Rush was interested in the development of scientific agriculture and contributed to it. As early as 1770 he lectured on agriculture in his courses on chemistry.[55] At the American Philosophical Society he played important roles, especially in the preparation for the Lewis and Clark expedition to the West, when at the request of President Jefferson he advised Captain Meriwether Lewis concerning botanical collections, inquiries to be made of the American Indian, and specimens of their medicinal and food plants. At another time Rush, again at Mr. Jefferson's request, addressed the American Philosophical Society on the preparation of maple sugar.[56] In 1787 his friend John Coakley Lettsom of London sent Rush seeds of the mangel wurtzel or scarcity root, a beet-like plant, and urged him to interest his fellow Americans in this plant for food for their stock.[57] Rush even published a digest of the pamphlet that Lettsom had sent to him with the seeds. It appeared in the *Columbian Magazine*.[58]

In November 1807, Rush gave an introductory lecture to students and guests at the University, "Upon the duty and advantages of studying the Diseases of Domestic Animals, and the Remedies proper to remove them." The lecture gives an idea of what Rush thought was the scope of the medical sciences. It began:

> The science of medicine is related to everything. A mere physician, that is, a physician who knows nothing but the sciences which are supposed to belong exclusively to his profession, is a nonentity. To deserve that title in its extensive import, it is necessary for us to know something of the principles and practice of every art, and pursuit of man. . . .[59]

55. Benjamin Rush, *Syllabus of a Course of Lectures on Chemistry* (Philadelphia, 1770). This was published by Rush for the use of his medical students. The outline was essentially that of his professor at Edinburgh, and several revisions were produced. It contained a section, "Vegetable substances, fermentation, agriculture," and in Rush's public lectures on chemistry (1773–74) one lecture was entitled "Of the elements or principles of agriculture."

56. Benjamin Rush, "An account of the sugar-maple-tree of the United States, and the methods of obtaining sugar from it, together with observations upon the advantages both public and private of this sugar" (in a letter to Thomas Jefferson), *Transactions of the American Philosophical Society* 3 (1792): 64–79.

57. Benjamin Rush to John Coakley Lettsom, Philadelphia, 28 September 1787. Butterfield, ed., pp. 441–45.

58. In vol. 2, pp. 130–33. Rush sent George Washington a copy of the pamphlet and some of the seeds of the mangel wurtzel. Butterfield, ed., pp. 459–60.

59. Benjamin Rush, "An Introductory Lecture to a Course of Lectures, upon the

While a student, Darlington would have met Professors Rush, Barton, Wistar, and other practicing physicians at the meetings of the Philadelphia Medical Society.[60] In November 1803, when Darlington was elected a member, Rush had presided over this society for more than ten years.[61] These societies afforded opportunity for the student to meet faculty members without the rigidity of classroom decorum. The meetings were rather loosely structured, ample opportunity being provided for personal discussion as well as public debate.

After taking his degree in Philadelphia in June 1804,[62] Darlington returned to his home in Chester County and commenced the practice of medicine. Having learned French during his preceptorship in Wilmington, he next used his leisure to study Latin. It was in the summer of 1805 that Darlington first devoted some of his time to experiment, for he repeated James Logan's experiment with maize.[63] He was soon appointed physician to the Almshouse and surgeon to a regiment of militia.[64] In the *Philadelphia Medical and Physical Journal* of December 1805 Darlington published an article on the medical properties of *Eupatorium perfoliatum*.[65] Being somewhat restless, he sought and obtained an appointment as surgeon to an East India merchantman

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Institutes and Practice of Medicine," *Memoirs of the Philadelphia Society for Promoting Agriculture* 1 (1808), pp. xlix–lxv. This address also appraises the need for a veterinary school in the United States.

60. The Philadelphia Medical Society was begun in 1765 by John Morgan, but only after three years it was engrafted upon the American Philosophical Society and lost its identity and function. It was revived in 1789 and was incorporated in 1792. Rush, the first president, served until 1809. He was succeeded by Benjamin Smith Barton, who served until 1816. Samuel X. Radbill, "The Philadelphia Medical Society, 1789–1868," *Transactions and Studies of the College of Physicians of Philadelphia* ser. 4, 20 (1952–53): 103–23.

61. William Darlington's proposal on 19 November 1803 and his introduction on 26 November 1803 are recorded as No. 109 in the membership list. *Minute Book, Philadelphia Medical Society, (6 Nov 1802–30 Nov 1806)*. Manuscript original in the Historical Collections of the Library of the College of Physicians of Philadelphia.

62. "Public Commencement held at the University of Pennsylvania 6th of June 1804," *The Philadelphia Medical Museum* 1 (1805): 86–87.

63. Darlington, *Memorials of John Bartram and Humphry Marshall*, p. 21.

64. Townsend, pp. 214–15.

65. William Darlington, "On the Medical Properties of *Eupatorium perfoliatum* or American Thorough-Wort" (letter, 5 Dec 1805), *Philadelphia Medical and Physical Journal* supp. 1 (1806): 10–12.

registered in Philadelphia, which sailed to Calcutta and back during the years 1806–7. Upon his return Darlington settled in West Chester, where he built a large and profitable practice. In June 1808, he married Catherine Lacey of New Jersey. Utilizing his leisure time, he then mastered German.

In 1811, he was appointed a trustee and secretary of the West Chester Academy. This marks the beginning of his active participation in general education.

When the British burned Washington in August 1814, it was not known where they would next strike with their combined military and naval forces; therefore, the governor of Pennsylvania called out the militia in early September to protect the city of Philadelphia. Darlington served with his regiment until it was disbanded.

After this military service, Darlington began three terms in the United States House of Representatives (1815–1817 and 1819–1827).[66] During the latter years of this public service he devoted his attention to the founding of the Chester County Cabinet of Natural Science. He presented the address at its organization and was its first president (1826).[67]

In the same year he published his *Florula Cestrica*, a catalogue of plants growing in the vicinity of West Chester. It represented a contribution to the advancement of agriculture for it contained an appendix describing the useful cultivated plants of the area.[68] He continued to expand his catalogue to include all of Chester County. The enlarged version appeared under a new title, *Flora Cestrica*, in 1837.[69] Always interested in the education of young people, he addressed a third edition in 1853 "to the young botanists of Chester County."[70]

Although he served as Canal Commissioner and later as Prothonotary and Clerk of the Courts of Chester County, Darlington continued to

66. Darlington was elected to the 14th Congress, 1819–1823, and to the 17th Congress, 1823–1827. Harrison, p. 1055.

67. William Darlington, *Address to the Chester County cabinet of natural science* (West Chester, Pa.: Siegfried, 1826).

68. William Darlington, *Florula Cestrica: an essay towards a catalogue of the phaenogamous plants* (West Chester, Pa.: Siegfried, 1826).

69. William Darlington, *Flora Cestrica: an attempt to enumerate and describe the flowering and filicoid plants* (West Chester, Pa.: Siegfried, 1837).

70. William Darlington, *Flora Cestrica: an herborizing companion for the young botanists*, 3rd ed. (Philadelphia: Lindsay & Blakiston, 1853).

practice medicine and exerted himself to increase the store of available knowledge and to improve the standards of medical practice. With other practitioners he established the Chester County Medical Society in 1828, and served as its first president until 1852, when he resigned.

AGRICULTURAL BOTANY:

AN

ENUMERATION AND DESCRIPTION

OF

USEFUL PLANTS AND WEEDS,

WHICH MERIT THE NOTICE, OR REQUIRE THE ATTENTION,

OF

AMERICAN AGRICULTURISTS.

BY WILLIAM DARLINGTON, M. D.

Ille Segetes, illic veniunt felicius Uvae:
Arborei fetus alibi, atque injussa virescunt
Gramina. *Virgil, Georg.* I.

Here golden harvests wave, there Vineyards glow,
Fruit bends the bough, or Herbs unbidden grow.
Sotheby.

PHILADELPHIA:
J. W. MOORE, 138 CHESNUT STREET.
NEW YORK:
MARK H. NEWMAN & CO., 199 BROADWAY.
1847.

Figure 5. Title page of William Darlington's *Agricultural Botany*. Original in the collections of The Library Company of Philadelphia.

Physicians have contributed to our welfare and our farm practice and income by introducing new species for cultivation. The tomato (*Lycopersicon esculentum* Mill.), according to Thomas Jefferson, was introduced into America by Dr. Siccary (John de Sequeyra), a Virginia practitioner of medicine.[71] The kohlrabi (*Brassica oleracea*, subspecies *cotulo rapa* D.C.) was introduced into Chester County by Darlington's fellow laborer in medicine, the skilled horticulturist, E. F. Rivinus.[72]

Darlington's crowning achievement for the farmer was the publication of his *Agricultural Botany* in 1847 (Fig. 5).[73] An examination of its contents reveal his thorough knowledge of farming practices and addresses the never-ending problem of all who grow plants for pleasure or profit—the encroachment of weeds. Darlington focuses attention on the undesirable plants that disturb crops, but he does mention some useful ones, mostly trees. He apparently sent copies of this book to friends. Two Kentucky recipients of note were Charles Wilkins Short and the Honorable Henry Clay.[74] Later editions were enlarged and rewritten by George Thurber and published under a new title, *American Weeds and Useful Plants*.[75] An excerpted edition under Darlington's name appeared in 1866 within the *United States Department of Agriculture Report, 1865*.[76]

71. Siccary, or de Sequeyra (d. 1796), was supposed to have been either Portuguese or Italian and is thought to have studied medicine under Boerhaave at Leyden. He emigrated to Virginia, probably before 1759. He practiced medicine in Williamsburg, and was the first physician to serve the patients in the Asylum for the Insane (1773–1795); his name appears on the journals of the House of Burgesses as early as 1767. He is credited with introducing the practice of eating tomatoes in Williamsburg and Virginia. Wyndham B. Blanton, *Medicine in Virginia in the Eighteenth Century* (Richmond: Garrett & Massie, 1931), pp. 86, 294–95, 320–21; Thacher, p. 74.

72. William Darlington, *Agricultural Botany* (Philadelphia: Moore, 1847), p. 8.

73. Ibid.

74. Charles Wilkins Short acknowledged his copy in a letter to Darlington from Louisville, Kentucky, on 9 June 1848 (original in the New-York Historical Society Library). Henry Clay's copy is dedicated to Clay on the front paste-down end paper and signed by Darlington. This copy is in the Margaret King Library, University of Kentucky, Lexington.

75. William Darlington, *American Weeds and Useful Plants*, revised, with additions by George Thurber (New York: Moore, 1859). The 1879 edition was published by Judd Co., New York. George Thurber, botanist and horticulturalist, served on the Mexican Boundary Survey (1850–53) and was editor of *American Agriculturalist* (1863–85). He was an early follower of the precepts of Darlington's *Agricultural Botany* and an expert in the study of grasses.

76. Printed by the United States Government Printing Office, this digest of Darlington's work on weeds is identified as "Weeds of American Agriculture."

It is interesting that other agriculturists in the Philadelphia area before and after Darlington also concerned themselves with weeds and their extermination. John Bartram in a letter to Philip Miller of 16 June 1758 appended a copy of his work, "A brief account of those plants that are most troublesome in our pastures and fields in Pennsylvania, most of which were brought from Europe."[77] Darlington thought it important enough to include this in its entirety when he published his *Memorials of John Bartram and Humphry Marshall with notices of their Botanical Contemporaries.*

Similarly, others had examined the alien plants. The Rev. Lewis David von Schweinitz prepared lists of English wild plants that had appeared in America.[78] Later Ezra Michener,[79] Darlington's contemporary and fellow physician-agriculturist, published a small book, *A Manual of Weeds*, addressed to the young farmer.[80] This was derived in part from Darlington's *Agricultural Botany.*

Darlington was a devoted Christian gentleman and after the deaths of several neighbors and fellow laborers in botany and agriculture, he collected their scattered correspondence, edited, and published it that their over-all contributions to science would be saved for future generations. The collected correspondence of William Baldwin was

77. Darlington, *Memorials of John Bartram and Humphry Marshall*, pp. 383–88.

78. The Rev. von Schweinitz was a Moravian clergyman, an excellent botanist, and one of the first mycologists in the world. His publications appeared primarily in the *Transactions of the American Philosophical Society* and Silliman's *American Journal of Science and Arts.*

79. Ezra Michener, of Chester County, Pa., attended medical school at the University of Pennsylvania (M.D., 1818). Here, in 1816, he attended the botanical lectures of William P. C. Barton. Michener was a practicing physician, naturalist, botanist, early mycologist, and collector of plants and animals. With William D. Hartman he published *Conchologia Cestrica* (1874); he also assisted Darlington in the preparation of *Florula Cestrica* (1826). Michener was widely known for his expertness in obstetrics and was one of the pioneers in the obstetrical use of ergot. He worked closely with Darlington in founding the Chester County Cabinet of Natural Science, and the Chester County Medical Society, Agricultural Society, and Horticultural Society. Kelly and Burrage, p. 789; John William Harshberger, *The Botanists of Philadelphia and their Work* (Philadelphia: Davis, 1899).

80. Ezra Michener, *A Manual of Weeds, or the Weed Exterminator* (Philadelphia: King & Baird, 1872).

published in 1843,[81] and that of John Bartram and Humphry Marshall was published in 1849.[82]

The whole story of physicians in the development of scientific agriculture has not been told; nevertheless, we can appreciate the great contributions of Darlington, his predecessors, and contemporaries to the present status of our 20th century agri-business that feeds the world.

5704 Apache Road
Louisville, KY 40207

81. William Darlington, comp., *Reliquiae Baldwinae* (Philadelphia: Kimber & Sharpless, 1843, reprinted New York: Hafner, 1969).

82. William Darlington, *Memorials of John Bartram and Humphry Marshall* (Philadelphia: Lindsay & Blakiston, 1849).

Otto Warburg
1883–1970
A Personal Appreciation

ERNST JOKL

OTTO WARBURG was born in Freiburg i. Br. His father was der Wirkliche Geheime Oberregierungsrat Professor Emil Warburg, Präsident der Physikalisch-Technischen Reichsanstalt. In this capacity he was successor to Hermann von Helmholtz, its founder. Emil Warburg was one of the architects of German physics at a time when the structure of the atomic nucleus was unravelled. A memorial plaque attached to a two-story building, Am Kupfergraben, recalls that it once housed the first German institute of physics. The building is situated in East Berlin, opposite the main entrance of the Pergamon Museum. It has survived World War II. The inscription on the plaque reads as follows:

> In this building Gustav Magnus founded and directed the first German Institute of Physics from 1842-1870. He was assisted by A.v. Bayer, E. du Bois-Reymond, R. Claudius, P.v. Groth, H.v. Helmholtz, G. Kirchoff, A. Kundt, E. Surasin, J. Tyndall, and Emil Warburg.
>
> Die Deutsche Physikalische Gesellschaft, 1930.

The Warburg Family

The Warburgs are a remarkable family. The banking house of M.M. Warburg in Hamburg was established in 1790. Aby Warburg, the art historian (1866-1929), one of the pioneers in his subject, assembled a unique art-history library financed by his banker brothers. In 1933 it was fortunately possible to transfer the collection to London, where it formed the nucleus of the Warburg Institute of London University. Sir Siegmund Warburg of London, the well-known banker, was another member of the family. Sir Oscar Warburg (1876-1937) was Chairman of the London County Council in 1925-26. The publisher Frederick J. Warburg, of Secker and Warburg, belonged to the family, as did O.

Transactions & Studies of the College of Physicians of Philadelphia ser. 5, vol. 5, no. 1 (1983): 67–75.

Warburg, the distinguished botanist (1859-1938). Eric Warburg is considered the most outstanding citizen of Hamburg today. Otto Warburg's mother, Elisabeth Gartner, was related to Wilhelm Wundt (1832-1920), one of the founders of modern psychology.

Otto Warburg, Charles Sherrington, and Albert Einstein

Otto Warburg's position in the history of biochemistry is comparable only to that of Sherrington in physiology and of Einstein in physics. Warburg received two Nobel Prizes, one for his research on the metabolism of tumors, and the other for the identification of the respiratory ferments. A third prize was under consideration in the late sixties for his discovery of the atomic transfer in photosynthesis. Five of Warburg's pupils received Nobel Prizes: Otto Meyerhof, Hans Krebs, Fritz Lipmann, Hugo Theorell, and Severo Ochoa. On the 100th anniversary of Otto Warburg's birth the German Bundespost plans to issue a stamp in his honor.

"The Making of a Scientist"

At his homes in Freiburg and Berlin, the young Otto Warburg became acquainted with many of the leading German scientists of the time, among them Albert Einstein, Fritz Haber, Max von Laue, James Franck, Max Planck, Walter Nernst, and Emil Fischer. His special veneration was reserved for the latter, who had directed the research for which Warburg received his doctoral degree in 1906 at the age of 24. In Fischer's laboratory he worked with three scientists who like himself were later awarded Nobel Prizes: Karl Landsteiner, Adolf Windaus, and Otto Diels. In 1931, when Warburg was appointed Director of the Kaiser-Wilhelm Institut für Zellphysiologie in Berlin-Dahlem, he gave instructions for the erection of the monument of Emil Fischer that stands in front of Warburg's former institute.

In an essay titled "The Making of a Scientist," Sir Hans Krebs (1900-1981), professor of biochemistry at Oxford, recipient of a Nobel Prize in Medicine in 1953, knighted in 1955, and honored in post-war Germany with the award of the Order of Pour le Mérite, expressed his thanks to Warburg. The tribute appeared in *Nature* on September 16, 1967. In it Krebs described the genealogy of the "family of research

workers" to which he himself belonged. Emil Fischer spent his apprenticeship with Adolf von Bayer, who had worked with Kekulé from 1859 to 1861. Kekulé's discovery of the ring structure of benzol laid the foundation for the development of organic chemistry. Adolf von Bayer, Emil Fischer, Otto Warburg, and Hans Krebs later received Nobel Prizes, and Kekulé would undoubtedly have received the prize if it had existed during his lifetime. Kekulé's teacher Gay-Lussac, born in 1778, was the master pupil of Berthollet, who was born in 1748. Berthollet had witnessed the unprecedented scientific development that followed the time in which Lavoisier (killed during the French revolution) established chemistry and separated the then-new science from alchemy, a mixture of knowledge and superstition. Another pupil of Gay-Lussac, Justus von Liebig, was appointed professor of chemistry in Giessen at the age of 21, on the recommendation of Alexander von Humboldt, who had met him in Paris.

World War I

At the outbreak of World War I Warburg volunteered for service and was accepted by the prestigious Horse Guards at Potsdam. He rose to the rank of lieutenant, was wounded in action, and was awarded the Iron Cross, First Class. On February 12, 1918, Warburg received a letter from Albert Einstein, lifelong friend of his father. It shows Einstein's humanity and deep concern for young people:

> Dear Colleague,
>
> You will be surprised to receive a letter from me because up to now we have walked round each other, without actually getting to know each other. I even fear that by this letter I might arouse something like displeasure; but I must write.
>
> I gather that you are one of the most able and most promising younger physiologists in Germany and that the representation of your special subject here is rather mediocre. I also gather that you are on active service in a very dangerous position so that your life continuously hangs on a thread: now for a moment please slip out of your skin and into that of another clear-eyed being and ask yourself: Is this not madness? You know this well and must agree with me. Yesterday I spoke to Professor Krauss who entirely shares my opinion and is also willing to make arrangements for you to be claimed for other work.
>
> I therefore entreat you, as a consequence of what I have said, that you may assist us in our endeavors to safeguard your life. I beg you to send

me, after a few hours of serious heart-searching, a few lines that we may know here that our efforts will not fail on account of your attitude.

In the anxious hope that in this matter, as an exception, reason will for once prevail, I am with cordial greetings,

Yours sincerely,
A. EINSTEIN

Warburg accepted Einstein's proposal because, as he said, "the war had been lost in any case." He returned to Berlin. It is quite possible that Einstein's intervention saved his life.

Photosynthesis, Cancer, and Respiratory Enzymes

Within a few years of Warburg's return from World War I three main subjects of investigation emerged: photosynthesis, cancer, and the chemical nature of the enzymes responsible for biological transformation of energy. During a visit to Barcroft's laboratory in Cambridge in the early twenties he had seen the Haldane-Barcroft "blood gas manometer," which he adapted for the measurement of rates of gas exchange. The Warburg apparatus, now used in biochemical laboratories all over the world, maintains equilibrium between gas and liquid by constant shaking of its glass vessels in a water bath. Manometry was the key factor in Warburg's discovery of the lactic acid fermentation of cancer tissue, in his work on cell respiration, fermentation, and photosynthesis, and in the identification of the iron porphyrin structure of the oxygen-transferring enzyme.

From 1928 onward Warburg developed the use of the photoelectric cell in combination with the provision of suitable sources of monochromatic light for measurement of the action spectrum of the oxygen-transferring enzyme of respiration.

In 1927 Professor A.V. Hill drew Warburg's attention to the discovery in 1896 by Haldane and Smith of the photosensitivity of carbon monoxide-hemoglobin. Hill recalled the event in a letter to me dated June 6, 1976. The methodological prerequisites for the success of Warburg's measurement of action spectra had been elaborated in the laboratory of his father in the Physikalisch-Technische Reichsanstalt in Berlin, where Otto Warburg worked during the year 1927-28.

In 1928 Emil Warburg completed *Wellenoptik und Polarisation—*

Photochemie, which was published in volume 18 of the *Handbuch der Experimentellen Physik*.[1] From this treatise Otto Warburg obtained current background information and methodological instruction, both of which he skillfully applied in his research. In his Nobel Prize Lecture, given in Stockholm on December 10, 1931, he dwelt in great detail upon the effect of light on inhibition of cellular respiration by carbon monoxide, and on determination of the absolute absorption spectrum. At that time James Franck remarked that Otto Warburg's Nobel Prize could well have been shared by Emil Warburg.

The third major technique introduced by Otto Warburg was the use of tissue slices. He applied the method first for measurement of the respiration of cancer cells. Later he learned that slices also perform many biosynthetic reactions. They proved invaluable in his studies of intermediary metabolism, degradative and biosynthetic, and also in investigation of the mechanism responsible for the transport of substances into and out of tissues.

Mitochondria

Numerous subdisciplines of biochemistry have developed as a result of Warburg's discoveries, among them the biochemistry of exercise. The fact that the transfer of energy in muscle is now understood is largely due to Warburg's work. As early as 1913 Warburg identified mitochondria. He called them "grana," defining them as "structural entities to which cell respiration is bound." "They are," he wrote, "power plants for the cell." The term "mitochondria" was introduced later by Claude, Hogeboom, Hotchkiss, and Schneider.[2] A.V. Hill, Otto Meyerhof, and Hans Krebs acknowledged that they had received from Warburg advice which was decisive for their own discoveries.

Pasteur Effect

In the early twenties, Otto Meyerhof, who spoke of Otto Warburg as his "teacher," had established that a regular relation exists between rate

1. H. Geiger and K. Scheel, eds., *Handbuch der experimentellen Physik*, vol. 18 (Leipzig, 1928), pp. 619–57.

2. See Albert Claude, "Studies on Cells. Morphology, chemical constitution, and distribution of biochemical functions," *Harvey Lectures 1947–48*, 43 (1950): 121–64.

of respiration and suppression of glycolysis in muscle tissue. He had demonstrated that consumption of one molecule of oxygen prevents the formation of two molecules of lactate. Meyerhof's findings supported the assumption that the enzymes forming lactate also function aerobically but that the lactate formed is resynthesized to carbohydrate at the expense of the energy provided by respiration.

In 1923 Meyerhof and A.V. Hill shared the Nobel Prize for their researches on muscle metabolism and on the analysis of heat production in muscle, respectively. In the same year Warburg reported that the rate of oxygen consumption of cancer cells does not differ from that of normal cells. Cancer cells, he had discovered, readily form lactate from glucose, and they do this to an extent which far exceeds the rates of formation of lactate in liver, kidney, pancreas, and submaxillary glands. In the context of his studies of the metabolism of tumors, Warburg reintroduced Pasteur's terms aerobic and anaerobic. He raised the question whether aerobic glycolysis is specific for neoplastic tissue. All animal cells, he reported, are metabolically active; they glycolyse anaerobically but do not do so aerobically. Warburg visualized a link between respiration and fermentation in terms of a specific chemical reaction, and for his chemical linkage he introduced the term "Pasteur reaction" (or "Pasteur effect"). Ethyl carbylamine, he had found, is a specific inhibitor of the Pasteur reaction, which he thought of as an aspect of oxidative phosphorylation. Since Warburg had discovered that heavy metals are components of the respiratory chain, he rightly postulated that heavy metals play a part in the Pasteur reaction. "The loss of normal respiration," he wrote in 1929, "is a key factor in carcinogenesis." Warburg put forward the hypothesis that cancer cells differ from non-cancer cells by their failure to suppress glycolysis in the presence of oxygen. He maintained this concept until the end of his life. In March 1969 Warburg asked me to comment on a suggestion by Ernst van Aaken, who believed that sustained training in running is of prophylactic value against cancer because of the enhanced oxygenation which exercise engenders. I advised Warburg that it would be worthwhile to follow van Aaken's hypothesis but emphasized that so far no evidence was available to support the notion.

The Last Years

During the last 25 years of Warburg's life, I was in close contact with him. We saw each other regularly in his institute and in his home. On many occasions I was privileged to be asked by him to comment on issues that had a bearing on problems of sport.

In 1952 when Theodor Heuss prepared a new edition of the five-volume work *Die Grossen Deutschen*, he invited Otto Warburg to contribute a biographical essay on Paul Ehrlich, whom he greatly admired. Warburg was aware that I had spent my childhood in Breslau in the company of Ehrlich's grandchildren: thus he knew of my close association with the family. I placed personal material at Warburg's disposal, and also gave him the text of my address on Ehrlich.[3] The oil portrait of Ehrlich by Eugen Spiro hung in Warburg's study, side by side with a painting of Louis Pasteur.

I had the good fortune to meet most of Warburg's pupils. During the early 30's I met Otto Meyerhof, who reviewed biochemical manuscripts submitted to Albrecht Bethe in his capacity as editor of *Pflügers Archiv*. At Meyerhof's recommendation my paper "Untersuchungen über den Kohlehydratumsatz des Warmblüterorganismus bei Muskelarbeit" was accepted.[4] For a summer I worked with Gerhardt Domagk in the laboratories of the I.G. Farben-Industrie in Wuppertal. Hugo Theorell, Director of the Nobel Institute in Stockholm, spent a semester as guest professor at the University of Kentucky. Hans Krebs and I were close friends. We met over the years in Oxford, Berlin, Wiesbaden, and New York. I supplied him with material on Warburg for his "Biographical Memoir of Fellows of The Royal Society,"[5] from which I have quoted in the present paper. He read the draft, adding to and commenting upon it in his last letter to me, written shortly before his death on November 22, 1981.

In July, 1970, a memorial meeting for Otto Meyerhof was scheduled in Heidelberg. Former staff members of Warburg's Institute who had known Meyerhof were invited, including Krebs, Lipmann, and Ochoa.

3. *Bulletin of the New York Academy of Medicine* 30 (1954): 968–75.

4. *Pflügers Archiv* 232 (1933): 687–702.

5. Hans Krebs, "Otto Heinrich Warburg," *Biographical Memoirs of Fellows of the Royal Society* 18 (1972): 629–99.

At the concluding session of the Heidelberg meeting we resolved to send a message of appreciation to Warburg, who had been unable to attend because of illness. I was asked to convey the message. On my return to Berlin on July 20, 1970, I visited Warburg in his house in Dahlem, and told him once more of the esteem in which he was held by his peers. It was the last time that I saw him. Ten days later he was dead. He was buried in the beautiful cemetery adjoining the Old Village Church in Dahlem. Only a small number of invited friends attended the funeral. During the service I sat next to Feodor Lynen, who owed to Warburg the concept of the Pasteur effect for whose elaboration he had received the Nobel Prize in 1964.

The coffin was covered with wreaths, flowers, and farewell greetings that included messages from the President of the Federal Republic of Germany, from the Max Planck-Gesellschaft, from the Leopoldina, from the Academies of Science of the Soviet Union and of the German Democratic Republic, and from his cousin Eric Warburg, whose family had founded the University of Hamburg after World War I and rebuilt it after it had been destroyed during World War II.

The obituary note written by Warburg for the Archives of the Order Pour le Mérite after Domagk's death in 1964 contains the following passage:

> Our order does not forget. Like the former Prussian Kings who founded the Order we try to extend justice to everybody to whom justice is due. So as Pasteur's name is indelibly written in the annals of the history of science as the discoverer of the pathogenic microbes, Domagk's name will be remembered as the architect of the victory over these microbes, a victory over the most deadly enemies of mankind.

Tributes even more exalted than that which Warburg had paid to Domagk were paid to his memory. Scientists all over the world felt that a king—their king—had died. The beautiful institute building, erected almost half a century earlier for Warburg, now houses the archives of the Max Planck Institutes.

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Author's Acknowledgement

The late Sir Hans Krebs allowed me to make use of his "Biographical Memoir of the Royal Society" of November 1978, in particular his notes on the Warburg family and on Otto Warburg's work on photosynthesis, cancer, and respiratory ferments. It was also at Krebs's suggestion that I have included the reference to the Einstein letter.

ESSAY-REVIEW

KING, LESTER S. *Medical Thinking. A Historical Preface.* Princeton: Princeton University Press, 1982. 336 pages. Price $19.50.

Reviewed by STEWART WOLF

THINKING, these days, is neither widely respected nor richly rewarded in medical practice. Lester King's book is, therefore, welcome and timely.

Using as a prototype our progressively enlarged understanding of tuberculosis, acquired during hundreds of years, King shows how the directions and the limitations of research, diagnosis, and treatment are determined, not by how smart a generation of doctors is, but by the concepts prevalent in their time. He shows how the steps toward understanding diseases are based on the kinds of questions that, in a particular era, it is possible to pose to nature.

King contends that early investigators were at least as bright as those who pose the questions today and, further, that the most pertinent questions in medicine are never answered fully. There may be an answer for each age but for the next age it usually appears insufficient or off-target. So it is with the concept of the cause of disease. King's chapters on the evolution of concepts concerning the causes of diseases are particularly enlightening. In them he traces the process whereby we came to recognize multicausality and to distinguish remote from proximate causes. In the heavily philosophical epilogue of his book he further dissects the meaning of cause, especially in relation to efforts to classify diseases.

In a brief chapter on treatment he argues that our medical forbears were no more empiricists than we are today but that their therapies, admittedly for the most part ineffective, were based on sound reasoning from what was known and believed at the time.

He thoroughly blasts the views of some of today's leaders of academic medicine who assign little importance to history and who see the "knowledge explosion" of the past century and a quarter as if it had burst from the brow of Zeus without significant intellectual antecedents. King painstakingly documents the antecedents and shows how their thinking, based on what was available to them, led to new discoveries

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and fresh formulations over and over again in successive generations.

Beyond the specifics of the lineage of present day concepts, King points out a more global intellectual contribution of history, and sees the heuristic value of earlier theories not so much in a presumed continuity with present day concepts, but in the evidence of the intellectual struggles required to build concepts out of what was observed. Thus does history provide lessons in persipicacity for today's explorers of the still unknown. According to King,

> History can give the physician a new awareness of the dynamic forces at work in medicine, the interactions of social and economic pressures, of ambition and pride and complacency, of cultural and technological limitations. And he will realize that he is dealing, not with antiquarian details, but with living problems that his predecessors faced, such as he himself is facing. By appreciating the difficulties of the past, he can gain increased acumen in identifying the difficulties of the present. If, however, he ignores the past, or regards its mistakes only as a way to achieve greater self-enhancement, then he is, in effect, blunting the critical sense he might otherwise develop. A sharp mind is even more important than a sharp scalpel.

Stephen G. Brush, in an editorial, "Should the History of Science be Rated X?" attributes some of the failure of the history of science to influence the thinking of present-day scholars to the historians of science themselves and to their predilection for the Whig interpretation of history, which he explains as follows:

> In the last few years, historians of science have applied the term to the accounts of scientific progress that tended to judge every scientist by the extent of his contribution toward the establishment of modern theories. Such an interpretation looks at the past in terms of present ideas and values, rather than trying to understand the complete context of the problems and preconceptions with which the earlier scientist had to work.[1]

Brush goes on to quote a concurring opinion by historian D. S. L. Cardwell:

> [I]f the history of science is to be used as an educational discipline to inculcate an enlightened and critical mind, then the Whig view... cannot

1. Stephen G. Brush, "Should the History of Science be Rated X?" *Science* 183 (1972): 1164–72.

> do this. For it must emphasize the continuities, the smooth and successive developments from one great achievement to the next and so on; and in doing so it must automatically endow the present state of science with all the immense authority of history.[2]

King's defence of history, clearly consonant with that of Brush and Cardwell, takes on special strength when he discusses the question, "What is a fact?"

> Medical students are inundated with facts. Each course in the curriculum has its own huge text crammed with facts. The faculty emphasizes the sacredness of facts through the so-called true-false objective examination, where for every question there is a right answer and a wrong answer. The students get sensitized to all this and become uneasy if a lecturer makes a statement running counter to what the text declared or what some other lecturer has said. If facts do not hold still, where will the student find stability? Yet neither students nor faculty show much interest in the basic question, "What is a fact?"

With a rich collection of examples, King shows how medical knowledge and understanding, as well as "facts," are moving targets and how the perceptions of today's physician or investigator can be sharpened through perspective gained from his awareness of the inferences of thinkers who have gone before.

This portion of the book alone justifies its being read by every medical student so he or she may acquire protection against an avalanche of information, and at the same time keep firmly in mind that the main job of the physician-in-training is to think and to understand.

Daniel J. Boorstin, Librarian of Congress, expressed a similar view at a White House Conference on *Library and Information Services* when he drew a sharp distinction between information and knowledge. "Information, like entertainment, is something someone else provides us. Each of us must acquire knowledge for ourself. Knowledge comes from the free mind foraging in the rich pasture of the 'whole-everywhere-past.' "[3]

The same thought was expressed several decades ago by L. J. Moorman, a former dean of the University of Oklahoma School of Medicine. He compared the modern scholar to a squirrel.

2. D.S.L. Cardwell, *Mem. Proceedings of the Manchester Literary and Philosophical Society* 106 and 108 (1963–64).

3. D.J. Boorstin, remarks at the White House Conference on Library Information Services, February, 1980.

> He should be free to garner the best from the topmost boughs of the boundless forest. Committed to the annulling tread of conformity within the confines of a miserable case, however, he cracks only the nuts supplied by his keeper.[4]

Emerson in these words saw the business of cracking only nuts supplied by a keeper.

> Men grind and grind in the mill of truism and nothing comes out but what was put in. But the moment they desert the tradition for a spontaneous thought, then poetry, wit, hope, virtue, learning, anecdote all flock to their aid.

Unfortunately, those with creative imagination are not always equally endowed with courage. It takes a hardy soul to withstand the pressure of disapproval and to continue running on the topmost bough. Too many of us walk voluntarily in the cage of conformity. Thus we cultivate habits of thinking which, in their efforts to achieve acceptance, lack freshness and originality.

One element that seemed to me to be missing from Dr. King's book was a recognition of the danger of new ideas or excessively bold innovation. One can readily agree with Lester King that an educated man is not just an informed man, but one who has learned to learn. Furthermore, one can easily accept that learning does not stop with the assimilation of information, that learning implies the ability to *use* information and observation to make judgments, discriminations, and choices. Such a performance, however, when highly creative and original, may upset people, especially educators and those in authority. When it does, there may be retaliation which at times has led to the innovator being put to death. Very few important intellectual advances have failed, at the very least, to arouse suspicion, hostility, or disapproval.

Twenty-five years ago, I delivered a medical school commencement address to which I gave the title, "An Invitation to Danger."[5] In it I quoted from a movie scenario written by Dylan Thomas. It is about Rock, the Professor of Anatomy in a medieval medical school. In those days they had difficulty getting bodies to dissect. The politicians and the clerics passed laws prohibiting the true study of human anatomy.

4. L.J. Moorman, personal communication.

5. Stewart Wolf, "Invitation to Danger," *Rocky Mountain Medical Journal* (1958): 66–68.

They thought their doctors could learn all they needed by poring over the books of Galen and perpetuating the errors and misinformation contained therein. Rock, the professor of anatomy, like most of his colleagues, was working with human bodies exhumed illegally by ghouls who earned their living by grave robbing. Unfortunately one of the men working for Rock became overzealous and began to provide bodies which had skipped the formality of natural death and burial. This man was caught killing off the denizens of skid row and selling them to Rock. Of course, it was Rock, who had known nothing of these crimes, who suffered for them when they were found out. He lost his job at the university. The scenario picks him up as he is giving his last lecture to his class. Let me quote from the author.

> As the camera moves over the heads of the class toward the front of the lecture hall, the figure of Rock fills the screen and he is saying: "To think, then, is to enter into a perilous country, colder of welcome than the polar wastes, darker than a Scottish Sunday, where the hand of the unthinker is always raised against you, where the wild animals, who go by such names as Envy, Hypocrisy, and Tradition are notoriously carnivorous, and where the parasites rule.
>
> "To think is dangerous. The majority of men have found it easier to writhe their way into the parasitical bureaucracy, or to droop into the slack ranks of the ruled. I beg you all to devote your lives to danger; I pledge you to adventure."

There is little else that I have found missing from Dr. King's book. In fact, in my judgment, it would have carried more punch had it been a bit shorter. In several places, after effectively making his point, he weakens his argument by continuing to press it. At times he is unnecessarily scornful as, for example, in his comments on the modern preoccupation with medical technology. At times, too, King's erudition gets in his way. When he explains the Latin derivation of a term and then describes the evolution of its usage, the thread of his persuasive reasoning is sometimes attenuated or even lost.

The main message of the book, however, does get across to the reader. In essence, Lester King is saying that the doctor's task is to reflect and to evaluate his findings with critical judgment. While ever more precise methods of data-gathering can improve the quality of the findings, the discriminative judgment required for their evaluation calls for intellectual capabilities that are not the product of a modern age but

are the expression of first-class minds to be found in every age. The more we know of the process of past thinkers, the clearer can become our own reasoning.

In his epilogue King examines the nature of truth and shows it to be to a large extent, like beauty, "in the eye of the beholder." That is to say, what seems true in a given time, depends to some extent on prevailing concepts, myths, and dogmas. He shows that a fact exists only in the sense of its original meaning, as something made or done. While he acknowledges that "science achieves its triumphs only by breaking wholes into manageable fragments and then studying the fragments in detail," he insists that the next step is the more important one as it "proceeds through analysis in order to reach a broad synthesis." It is the contributions that reflect inspired synthesis that, King contends, yield the richest legacy of history.

The book is easy to read and the message is an important one for today's doctors and doctors-to-be.

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ESSAY-REVIEW

DEJONG, RUSSELL N. *A History of American Neurology*. New York: Raven Press, 1982. 157 pages. Price $17.50.

Reviewed by LAWRENCE C. MCHENRY, JR.

ACCORDING to Pearce Bailey, the history of American neurology can be divided arbitrarily into four periods: the first from 1862 to 1880, the second from 1880 to 1900, the third from 1917 to 1945, and the fourth from 1945 to the present. Dr. DeJong's *A History of American Neurology* divides the development in a different and more precise manner, namely, the early work on diseases of the nervous system by physicians of the American revolutionary and post-revolutionary eras and the next, the actual birth and youth of American neurology after the Civil War. Most consider that William A. Hammond (1828–1900) and S. Weir Mitchell (1829–1914) were the founding fathers of neurology in the United States. Dr. DeJong rightly points to physicians of the late 18th century as early pioneers of our field; he mentions the writings of James Jackson (1777–1868), who in his *Letters* (1855) wrote on headache, epilepsy, apoplexy, palsy, chorea, and neuralgia. James Jackson was the maternal grandfather of James Jackson Putnam, for whom the chair of neurology at Harvard was named. John Kearsly Mitchell (1798–1858), father of S. Weir Mitchell, had great interest in the nervous system and his influence was probably one of the factors that impelled his son toward neurology during the Civil War. In his *The Practice of Medicine* (1842) Robley Dunglison (1798–1869) included an extensive section on diseases of the nervous system.

In the United States as in other countries neurology evolved out of both internal medicine and psychiatry. Dr. DeJong points out the contributions of Benjamin Rush, recorded in his *Medical Inquiries and Observations* (1812) and briefly discusses Rush's notions about organic affections of the brain—such as brain tumors, apoplexy, and epilepsy—that cause abnormal mental processes. One of Dr. DeJong's contributions is his identification of Amariah Brigham (1798–1849) as the author of "the first American book dealing with neurology," namely *An Inquiry Concerning the Diseases and Functions of the Brain, Spinal Cord, and Nerves* (1840). Brigham, one of the founders of the Association of

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Medical Superintendents of American Institutions (later to become the American Psychiatric Association), spent most of his career as superintendent at mental hospitals. His *Inquiry* provided one of the early descriptions of the structure and function of the brain, medulla, spinal cord, and cranial nerves. As Dr. DeJong points out, Brigham's monograph deals primarily with mental disease, but mentions apoplexy, epilepsy, chorea, delirium tremens, tic douloureux, and infections of the nervous system.

Dr. DeJong accurately places Charles Édouard Brown-Séquard (1816–1894) in the transition between physicians of the post-Revolutionary era and the Civil War founders, namely William Hammond and Silas Weir Mitchell. In his peripatetic career Brown-Séquard was Professor of the Institutes of Medicine at the Medical College of Virginia in Richmond for a few months in 1854 and, after an interim at the National Hospital, Queen Square, London, returned in 1864 to Harvard Medical School as Professor of Physiology and Pathology of the Nervous System. In his *Course of Lectures on Physiology and Pathology of the Central Nervous System* (1860) Brown-Séquard wrote the first description of the clinical phenomena that result from the hemisection of the spinal cord. His lectures on *The Diagnosis and Treatment of the Principal Forms of Paralysis of the Lower Extremities* (1859) may be considered the first monograph devoted entirely to clinical neurology and first published in the United States. Although these presentations were given as a series of lectures at the Royal College of Surgeons, they were first published in the United States when Brown-Séquard was at Harvard. Hence, I must disagree with Dr. DeJong's statement that Brown-Séquard's contributions to clinical neurology were "not significant"; he actually played a significant role in the development of the subject in the United States.

The second chapter of Dr. DeJong's book, "The Beginnings of American Neurology," contains biographical sketches of S. Weir Mitchell and William A. Hammond; most of this material has been taken from ordinary published sources. Brief sketches are then given of Roberts Bartholow, Edward Seguin, James Jackson Putnam, Charles Mills, George Huntington, and James S. Jewell. Dr. DeJong actually offers only one paragraph on how neurology developed in the United States. His biographical notes of the earlier contributors to American neurology are convenient to have in one place, but differ little from those published in Haymaker and Schiller's *Founders of Neurology*.

The third chapter, "American Neurological Association," along with Chapter Four, "American Neurology During the Last Quarter of the 19th Century," is actually a condensation of Ramsey Hunt's chapter, "The Foundation and Early History of the American Neurological Association," which first appeared in the *Semi-Centennial Volume of the American Neurological Association* (1924) and was republished in the *Centennial Volume of the American Neurological Association* (1972). It is to be wished that Dr. DeJong had used other sources than those already easily available and that he had offered some original contributions and insights. The reader is given condensed biographical sketches of Gray, Spitzka, Dana, Sachs, Beard, Dercum, Webber, Edes, Knapp, Bauduy, Hughes, and briefer references to the founders of the New York Neurological Society (1872). The biographical sketches and the brief intercalated paragraphs are full of names, dates, and places but say little about trends in any particular area of neurology. There is a short history of the evolution of the thermometer, but the importance of the National Hospital, Queen Square, London in the history of our specialty receives brief mention only. This theme is now being explored by the present reviewer.

Chapters Five and Six are devoted to neurology during the first and second quarters of the 20th century. These again are composed essentially of biographical sketches resembling those in Haymaker and Schiller's *Founders* and in the centennial volume of the American Neurological Association. Mention is made of the founding and founders of the New York Neurological Institute and there is a good, although brief, introduction to the development of neurology in New York. Early neurology in Philadelphia is mentioned casually; less is said about neurology in Chicago. There are paragraphs on neurology during World War I, on neurological research, and on diagnostic techniques. In Chapter Six, electroencephalography receives three paragraphs and angiography one. There are brief discussions of twentieth century therapy of neurological diseases such as infections, epilepsy, and vascular disease, and there are broad generalizations such as the statement that "the extensive nature of the collateral circulation of the brain has now been outlined, as has the frequency with which extracerebral disease (stenosis or occlusion of the major cerebral arteries in the neck) may lead to extensive cerebrovascular dysfunction." Although this statement is true, knowledge about the collateral circulation of the brain began in the seventeenth century with Willis's demonstration of

the hexagonal circle at the base of the brain and Ruysch's injection studies of the subarachnoid arterial anastomoses. It is true that Ramsey Hunt in 1914 pointed out the clinical significance of carotid stenosis and indeed it was in this century (in the 1950s) that vigorous surgical attacks on the carotid artery began. It would have been valuable for Dr. DeJong to have made more precise statements instead of broad generalizations, but these would have enlarged his brief monograph into a more definitive work.

Chapter Six gives a cursory overview of important events, such as the introduction of diagnostic techniques and various treatments of neurological disease, but only in outline form. There is really no developed discussion which might explain the rapid advances of neurology. It is good to have biographical sketches condensed so that the beginner may feel impelled to look further into the life of works of a particular individual about whom he may be curious. The references at the end of Chapters Five and Six contain biographical references primarily to the American Neurological Association *Centennial Volume* and Haymaker and Schiller's *Founders* interspersed with an occasional short summary of events. Although these may be beneficial to the beginner, others may find this system frustrating because of its haphazard character.

Chapters Seven to Eleven contain the most original material, since they cover areas in which Dr. DeJong had personal involvement or discuss people with whom he has had personal acquaintance. These passages include discussions of the founding of the American Board of Psychiatry and Neurology, the American Academy of Neurology, and the various journals devoted to neurology. Only casual reference is made to the *Transactions of the American Neurological Association*, a gold mine of material on early neurology in the United States. The first two volumes of the *Transactions* were published independently in 1875 and 1877. Volume Three was published in the *Journal of Nervous and Mental Diseases*. From 1878 through 1891 the *Transactions* were all published in the *Journal of Nervous and Mental Diseases*. The *Transactions* resumed as separate publications with Volume Seven in 1892 and have continued up to the present. Unfortunately the series was discontinued with the 1981 volume.

Dr. DeJong's *A History of American Neurology* is the first separate monograph on this subject. Prior to the publication of the *Centennial Volume of the American Neurological Association*, the *Semi-Centennial Volume* of 1924 was the only available genuine and single source for the history of

the speciality. The *Centennial Volume* reprinted the chapters by Ramsey Hunt and Charles Mills on the history of American neurology. These were preceded by Houston Merritt's brief chapter on the development of neurology in the previous fifty years. To date, except for the early recollections of Hunt and Mills, there has been no presentation in a single paper, chapter, or monograph on the manner in which neurology in the United States actually evolved. The paper by J. D. Spillane, "Hughlings Jackson's Contemporaries: The Birth of American Neurology,"[1] is an exception, which Dr. DeJong apparently has overlooked. Recently Bonnie Ellen Blustein contributed "New York Neurologists and the Specializations of American Medicine."[2] Her doctoral thesis, *A New York Medical Man: William Alexander Hammond, M.D. (1828–1900), Neurologist* (University of Pennsylvania, 1979), was the first separate biography of William A. Hammond. We have in Dr. DeJong's book a variety of facts, references to publications, foundations of journals and societies, and lists of names, presentations, and the like among the many scattered facts. Perhaps one day a more smoothly organized history of American neurology will be written.

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1. *Proceedings of the Royal Society of Medicine* 69 (1976): 393–408.
2. *Bulletin of the History of Medicine* 53 (1979): 170–183.

ESSAY-REVIEW

CIPOLLA, CARLO M. *Fighting the Plague in Seventeenth-Century Italy.* Madison: University of Wisconsin Press, 1981. 162 pages. Price $13.50.

Reviewed by PAULINE M. H. MAZUMDAR

IN 1720 the last epidemic of plague to reach Western Europe occurred in Marseilles. The death rates were as high as any in the earlier epidemics: Marseilles is thought to have lost about 40,000 of its 90,000 inhabitants. The disease spread through Provençal towns and villages, but it stopped there and spread no further.

From 1720 onwards, mortality rates fell and populations increased all over Western Europe, and historical demographers have suggested that the ending of plague was a major cause of that population growth. The question of why plague stopped is therefore a very important one, since it may have some bearing on the beginning of what has been called the Vital Revolution.

To earlier writers on population growth[1] it was obvious that new hospitals and improved medical care were the reason for falling mortality rates, but recent demographers have become more skeptical. Both G. K. Helleiner[2] and Thomas McKeown[3] feel that eighteenth-century medicine could have had no effect on death rates. Helleiner suggests that over-all mortality rates fell not because of a fall in ordinary everyday mortality, but because of the disappearance of the peaks represented by plague epidemics. And so we come back to the problem of why plague stopped.

The case of seventeenth-century Italy is germane to this inquiry because in Italy the last epidemics of plague took place in 1657, more than half a century earlier than in the rest of Western Europe.

1. G. Talbot Griffith, *Population Problems of the Age of Malthus* (Cambridge: University Press, 1926).

2. G.K. Helleiner, "The Vital Revolution Reconsidered," *Canadian Journal of Economics and Political Science* 23 (1957), reprinted in D.V. Glass and D.E.C. Eversley. eds., *Population in History: Essays in Historical Demography* (London: Arnold, 1974), pp. 79–86. (hereafter cited as *Population in History*)

3. T. McKeown and R.G. Brown, "Medical Evidence Related to English Population Changes in the Eighteenth Century," *Population Studies* 9 (1955), reprinted in Glass and Eversley, *Population in History*, pp. 285–307.

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Carlo Cipolla has been working in this important area for many years, as Professor of Economic History both in Turin and the University of California at Berkeley. He has written on the history of money and prices in Renaissance Italy and in the wider Mediterranean area, and on the relations between population and economic changes on the world scale. He is well known to historians of medicine for his work on public health and plague in Italy: *Cristofano and the Plague* (1973), *Public Health and the Medical Profession in the Renaissance* (1976), and *Faith, Reason and the Plague in Seventeenth-Century Tuscany* (1979). The present book is the result of a series of lectures that Professor Cipolla gave at the University of Wisconsin in 1978.

The public health system of the North Italian states was admired but not copied until much later by the rest of Europe. It began with the Black Death of 1348, and by the mid-sixteenth century was an important part of city government. There were permanent magistracies with legislative, judicial, and executive powers in Venice, Milan, Genoa, and Florence, and temporary magistracies subordinate to them in the smaller towns and villages. The population growth which affected all of Western Europe in the eighteenth century seems to have begun rather earlier in Italy than elsewhere. A population which had been fairly constant at less than 12 million was about 11 million in 1660, after the last epidemic of 1657, but then rose steadily, from 13 million in 1700 to 17 million in 1770, and 20.4 million in 1820.[4] Until the last epidemic in 1657, demographic gains were regularly lost in peaks of mortality which could reach two or three hundred per thousand, but after this time the gains were permanent.

Cipolla himself has shown that there was no general improvement in the standard of living in late seventeenth and early eighteenth century Italy. Unlike Holland, France, and England, Italy was declining economically.[5] Can the control of plague epidemics be ascribed to the development of organized public health systems by these cities? Cipolla's study of the activities of the health authorities bears on this question.

The theoretical basis of most early public health measures was the miasma theory, in which the smell of filth and putrefaction was taken to

4. Carlo Cipolla, "Four Centuries of Italian Demographic Development," in Glass and Eversley, *Population in History*, pp. 570–87.

5. Carlo Cipolla, "The Decline of Italy: the Case of a Fully Matured Economy," *Economic History Review* 5 (1952): 178–87.

be the agent responsible for disease. Although the link is not as direct as the theory suggests, urban odors are not unrelated to disease, particularly water-linked diseases such as typhoid, dysentery, and malaria. The theory therefore gained plenty of support from observation, and from statistics, as the nineteenth century sanitary movement shows. The measures suggested by this theoretical approach were often successful in controlling disease.

Cipolla's close examination of the public health measures insisted upon by the North Italian cities is important in showing how far administrative decisions based on this theory might have been successful. He emphasizes that many health ordinances were difficult to enforce; they were often both expensive and distressing: segregation of the sick in pesthouses, the interruption of trade, and the burning of belongings were hard on the people that these measures were meant to protect.

Plague prevailed in summer months, when cities smelled their foulest. People who handled furs, textiles, and bags of grain were particularly at risk, as the health authorities knew. Miasmatic particles originating in the effluvia of city streets and stables were thought to adhere to these rough surfaces. The theory therefore led to the cleansing of cities, the burning of clothes and bedding, and the banning of trade with areas known to be infected. The magistrates of Florence confiscated the filthy bedding of the poor and replaced it with new (p. 15). These measures were based on the miasma theory, but the practice coincided with measures that would have been supposed effective equally under a theory implicating rats and their fleas. "Banning" ("*bando*" is translated "banishment" by Cipolla) and "suspension" of trade with infected areas may well have been effective, though expensive. Cipolla remarks that urban administration was highly developed and fairly sophisticated, but the efforts were useless in the absence of a correct theory of disease transmission. Closing a city to trade and quarantining its inhabitants he feels to have been "worse than useless... as modern epidemiologists point out, confining people where the source of infection was harboured meant increasing the infection" (p. 18). However, it may have prevented the disease from spreading elsewhere.

By 1652, authorities in Genoa and Florence had organized a "*concerto*" in their measures for dealing with ships that came from infected areas. This agreement lasted only until 1656–57, when an epidemic in Genoa forced Florence to ban its partner Genoa, which

brought the "*concerto*" to an end. Cipolla sees this soon-abrogated agreement as the forerunner of the international health cooperation which began to develop from 1815 on, in the fight against nineteenth-century epidemics of cholera.

This short piece of work shows all of Cipolla's usual familiarity with archival sources. He knows intimately and handles confidently documents from seventeenth-century city administrations. But the book would have been better, and the lectures, too, if he had given his audience a little of the historiographic background—*why* it is interesting to know the details of city health administrations, and how this relates to the McKeown point of view that nothing seventeenth-century medicine—or eighteenth-century either—could do could have had any effect on mortality rates. The interesting question of whether Italian urban health administration could have contributed to protecting northern Italy from sixty years of plague is not stated. Perhaps for Cipolla this question is so obvious that he feels that it need not be restated, or perhaps he is quite sure that since the theory was wrong the efforts were bound to have been wasted. Either way, a statement that sets a piece of work in its historiographic context adds to its usefulness and enlarges its audience. And for those of us who are teachers, it means that we can use it as a tool to open the can of worms that is the historiography of the plague.

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Richard A. Kern
1891–1982

LOUIS TUFT, M.D.

WITH the death of Richard Arminius Kern on July 26, 1982, the medical world lost a brilliant mind and Philadelphia lost one of its outstanding citizens. Dr. Kern was born in Columbia, Pennsylvania, on February 20, 1891, the son of Reverend George Kern and Wilhemina Kern. His father was a pastor of Evangelical and Reformed churches, first in Columbia and later in Philadelphia. Dr. Kern graduated from Columbia High School in 1907, received an A.B. degree from the University of Pennsylvania in 1910, and its medical school doctorate in 1914. He graduated with honors and was elected to the Alpha Omega Alpha Honorary Society. After a two-year rotating internship at the University Hospital he served as senior resident in internal medicine from 1916 to 1917. In August, 1917, during the First World War, he enlisted in the Navy Medical Corps, serving first as Lieutenant J.G. and later as Lieutenant, with duty on the U.S.S. Solace, the hospital ship of the Atlantic Fleet, until his discharge in October, 1919. On returning to civilian life, he took up general medical practice in the Kensington section of Philadelphia, joined the Department of Medicine at the Hospital of the University of Pennsylvania under its chairman, Dr. Alfred Stengel, and participated in the work of instruction.

As one of his students, I was met during ward rounds by a tall, handsome man in naval officer's uniform. His engaging appearance, clear diction, and logical presentation kept us fully attentive. At this early stage he manifested the attributes which would strongly impress his future audiences. Accepting a suggestion by Stengel, who had heard about skin testing as a diagnostic procedure in asthma and hay fever, Kern became greatly interested in the new field of allergy. He established one of the early allergy clinics at the University Hospital. At the same time he maintained an active practice in allergy and internal medicine, which he continued until his retirement in 1973. He wrote 132 articles on various subjects including those related to allergy. He was one of the first to utilize extracts of autogenous house dust and believed it to have notable advantages over stock dust extract. One of

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his most important contributions was the report in 1934 of a study conducted in conjunction with his associate, Dr. Harry Schenck, in which they showed conclusively that allergy was often responsible for nasal polyposis. During the early twenties he joined the newly formed American Association for the Study of Allergy and the Society for the Study of Asthma and Allied Conditions. In 1932 and 1933 respectively, he presided over these organizations.

Kern's interest was not confined to allergy. He took his turn as a ward chief, participated in the instruction of medical students, and in 1927 became chief for the administration of the medical outpatient clinics at the University Hospital. From 1925 until 1967 he was Associate Editor and Editor of the *American Journal of Medical Sciences*. During his stewardship this journal was highly esteemed. Despite his many other duties, he read many of the articles submitted to him instead of sending them to others for review.

In 1925, Kern joined the Medical Corps of the Naval Reserve, became Lieutenant Commander in 1935, and Commander in 1939. During this period he organized Naval Specialist Unit No. 31. With the outbreak of World War II, he participated actively. He served mostly in the South Pacific theatre on the U.S.S. Solace from February, 1942 to March, 1946 as Commander, then as Captain (June, 1942), and as Commodore (November, 1945). During this period he acted as traveling Medical Consultant on the Staff of Admiral W.F. Halsey and as Chief of Medicine and Rehabilitation at the Naval Hospital in Philadelphia. He supervised the care of all the blind and deaf patients and the amputees among the personnel of the Navy, Marine Corps, and Coast Guard east of the Rocky Mountains. He remained active in the Naval Reserve after his discharge. Although he retired from the Navy in 1955 (with the rank of Rear Admiral, U.S.N.R. ret.), he served either as a member or more often as the chairman of various committees in the Defense Department related to medical defense. In 1948 he was made a Consultant in Medicine to the Surgeon General of the Army. His duties necessitated visits to both the European theatre of operation and the Far Eastern Command. He also was a consultant in medicine to the Navy from 1949 on, with assignments to the Caribbean Defense areas (1949) as well as to Cairo (1953). Active in societies related to medicine in defense, he was president of the Society of Medical Consultants in the Armed Forces in 1954 and president of the Association of Military Surgeons of the U.S.A. in 1960.

His career in military medicine did not keep him from his basic interest in internal medicine and, to a lesser extent, in allergy. He continued in the Department of Medicine of the University of Pennsylvania, which he served first as Instructor in Medicine in 1919. In 1934 he became Professor of Clinical Medicine in both the undergraduate and the graduate schools. He served also on the staff of the University Hospital. In 1936 he was certified in internal medicine and in 1941 in allergy. In 1946 he became Professor of Medicine and Head of the Department of Medicine at the Temple University Hospital and School of Medicine of Philadelphia. In 1956 he reached the rank of Emeritus Professor of Medicine. During his active tenure his reorganization of his department helped form the basis for the outstanding local and national reputation that it acquired. In 1958 he became a trustee of Temple University and contributed greatly to the further development of this institution. In recognition of his efforts, the Board of Trustees awarded him the title of Honorary Life Trustee in 1976.

He was a member of numerous medical societies, among which are the Association of American Physicians, Society for Clinical Investigation, American Clinical and Climatological Association, American Society of Internal Medicine, Cosmopolitan Medical Club, Sydenham Medical Coterie, and the American Association for the Advancement of Science.

He was President of the Philadelphia County Medical Society (1949), of the College of Physicians of Philadelphia (1952–1954), and of the American College of Physicians (1957). Of the last-named he became a Master in 1960. In 1963–64 he presided over the Pennsylvania Medical Society. He delivered such lectures as the I. Ridgway Trimble Lecture before the Medical and Chirurgical Faculty of the State of Maryland (1954), the first John Walker Moore Memorial Lecture at the University of Louisville (1954), the first H.S. Chouke Lecture (1957) and the eighty-fifth Mary Scott Newbold Lecture (1963), both at the College of Physicians of Philadelphia. He received an honorary award from the Sigma Xi Honorary Society (1927); L.L.D. from Lebanon Valley College (1947); and Sc.D. from Franklin & Marshall College (1947), Temple University (1958), and Bucknell University (1959).

Kern's participation in so many medical groups in the medical and military communities never kept him from his civic duties. He resided in Merion Township, a suburb of Philadelphia, joined the Board of Health there in 1934, and was its President from 1955 to 1958. From

1957 to 1963, he was a member of the Board of Health, Department of Public Health, Philadelphia, serving as its Vice-President during 1960–1961. He was a member of many local committees involved in services relating to hospital, nursing, and other community medical matters. Surprisingly, he still found time for some non-medical activities, being a member of the Masons in the University Lodge No. 610, Grand Master in Pennsylvania (1945–1946), and Grand Minister of State Supreme Council (1960). During his medical school years, he joined the Phi Chi Medical Fraternity and in 1930 became a member of Phi Gamma Delta, a general fraternity. He was a member of the Union League of Philadelphia, the Philadelphia Country Club, the University Club of Philadelphia (1923–1954), and the Army and Navy Club of Washington, D.C. He was a member of St. James Church, United Church of Christ in Havertown, Pa. In August, 1927, he married Donna A. Couch of Nyack, Pennsylvania, who died in March, 1969. They had two children, Richard Bradford Kern and Donna Natalie Kern (Dr. Donna Kern McCurdy, deceased in 1978). In October 1976 Dr. Kern married Ellen J. Hawkins.

Kern understood and spoke French, German, Spanish, Russian, Portuguese, Japanese, and a smattering of Chinese. Two of these languages, probably Russian and Japanese, he learned while on the U.S.S. Solace in the South Pacific.

How does one summarize and characterize such a mental giant? Here was a man who accomplished things that would have been extremely difficult for the average person. Kern was an activist, not in the political sense but in his ability to participate fully in any committee or organization of which he was a member. He regarded none of these appointments as solely honorary but as obligations requiring his personal attention. Perhaps one answer was his ability to avoid wasting time. I know from personal experience that he never hesitated to see a member of his staff, but one did not linger to discuss trivialities once the conference was ended.

If a Nobel prize were awarded to the physician who contributed the most to medicine—both in clinical practice and in instruction to undergraduates and graduates—who inspired and aided many students and associates, Richard A. Kern would stand high on the list of candidates. His many qualities were summarized best by the committee of the American College of Physicians which awarded him the Alfred Stengel Memorial Medal. The citation read as follows:

To Richard A. Kern, Teacher, Editor, Scholar, Linguist. A world traveler in the cause of medicine. A Naval surgeon who practices medicine and not surgery. A former Secretary General, President, and member of the Board of Regents, and pupil of Dr. Stengel for whom this award is named.

Dr. Kern has practiced and taught medicine with skill and explored the mysteries of hypersensitivity in depth. He has served this College, many institutions, his Country, and his community. He has participated in and contributed to civic affairs far above the call of duty, all for the promotion of the public good.

For all of his contributions to this College and to other institutions, we honor him. . . .

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Defensive Medicine as a Basis for Malpractice Liability

HAROLD L. HIRSH and TRENT S. DICKEY

CAN the practice of defensive medicine give rise to a medical malpractice claim? Although the practice of defensive medicine is mentioned repeatedly in medical literature and in court malpractice decisions, it has rarely been considered as an independent basis for liability.

The term is usually used to refer to any act or commission on the part of a physician that is performed explicitly for the purpose of either averting malpractice liability or of providing appropriate documentation for defense against potential litigation. The overutilizaton of diagnostic tests and treatment procedures is called positive defensive medicine. The second category, negative defensive medicine, refers to the withholding of a potentially beneficial procedure because of high risk of malpractice litigation. Negative defensive medicine is usually not as prevalent or as controversial as positive defensive medicine. A continuing controversy exists within the medical and legal communities as to the pervasiveness of the practice of defensive medicine.[1]

In 1971 the Duke Univeristy Law Journal[2] and in 1972, the University of Pennsylvania[3] conducted independent surveys in order to test the extent of this practice. Both studies concluded that although defensive medicine existed and the fear of litigation did influence physicians, the practice was much less extensive than had been believed previously.[4] In 1976, however, a survey of first-year residents in internal medicine concluded that 9% of all diagnostic tests and 14% of all x-ray examinations were motivated by fear of litigation.[5] One year later the American Medical Association Center for Health Services Research and Development

1. N. Hershey, "The Defensive Practice of Medicine: Myth or Reality," *Milbank Memorial Fund Quarterly* 50 (Jan. 1972): 69–98 (hereafter cited as Hershey).

2. Project, "The Medical Malpractice Threat: A Study of Defensive Medicine," *Duke Law Journal* (1971): 939–72 (hereafter cited as *Duke*).

3. Hershey, p. 74.

4. Ibid.

5. L. F. Hayes, "Defensive Medicine, The Incorrect Solution," *Michigan Medicine* 76 (May 1977): 267–68 (hereafter cited as Hayes).

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participated in a survey of 500 physicians;[6] of the 20% who responded, 76% indicated that they were currently practicing defensive medicine.[7] Unfortunately, none of the surveys of defensive medicine has had a large enough sample size or has used a method of testing that would give scientific reliability or significance to the findings. However, one finding is clear: defensive medicine is being practiced and its existence is acknowledged by practicing physicians.

Defensive medicine is a controversial subject. Some physicians maintain that such practice is actually beneficial;[8] others see it as a very harmful reaction to the threat of medical malpractice.[9] The majority of the commentaries on defensive medicine counter that the practice exposes patients to needless risks and medical costs.[10] The former secretary of Health, Education, and Welfare, Caspar Weinberger, estimated in 1975 that the practice of defensive medicine may cost up to 7 billion dollars annually.[11] One recent study concluded that defensive medicine accounted for 9% of all laboratory costs and 14% of all x-ray examinations.[12] A complicating problem is that if the practice of defensive medicine is as extensive as these studies suggest, defensive medical practice itself may be establishing artificial health care standards which would further frustrate efforts to identify its existence and would affect the quality of medical care generally.

Surveys of physicians seem to suggest that the practice of negative defensive medicine is much less frequent than its counterpart, positive defensive medicine, but no studies have actually been devised to measure its extent. In most instances, a physician unwilling to treat or

6. *American Medical News* (28 March 1977): 1.

7. Ibid.

8. R. P. Bergen, "Defensive Medicine is Good Medicine," *Journal of the American Medical Association* 228 (May 1974): 1188–89 (hereafter cited as Bergen).

9. J. E. Stolfi, "Preventing Malpractice," *New York State Journal of Medicine* 74 (1975): 1198, 1248.

10. See, for example, C. Wood, *The Influence of Litigation on Medical Practice* (New York: Grune, 1978); L. R. Tancredi and J. A. Barondess, "The Problem of Defensive Medicine," *Science* 200 (May 1978): 879–82.

11. C. W. Weinberger, "Malpractice—A Medical View," *Arizona Medicine* 32 (1975): 117–18.

12. M. L. Garg, W. A. Gliebe, and M. B. Elkhatib, "The Extent of Defensive Medicine: Some Empirical Evidence," *Legal Aspects of Medical Practice* 6 (Feb. 1978): 25–29.

perform a beneficial procedure because of the fear of litigation will refer a patient to a specialist or will simply refuse to accept the patient initially.[13] It is difficult to conceive that such a reaction could give rise to a successful liability action. If a physician does, however, fail to perform a procedure which is indicated to be in his patient's best interest and also fails to refer his patient to another physician, a malpractice action based upon negligence would be appropriate, and probably would be successful.

An attending physician's duties include the determination of appropriate diagnostic tests for his patients. Whether these tests are mere formalities, such as routine blood tests, or whether they involve risks, like arteriograms or lumbar punctures, a physician is not the insurer of his patients merely because he employs dangerous tests.[14] He may be culpable for negligent handling of these procedures, however.

Unnecessary Diagnostic Testing

The primary question is whether the ordering of needless diagnostic procedures motivated by the physician's desire to avoid litigation can form the basis for liability for a resulting injury or for the mere performance of the test. To resolve this question it must first be determined if the test was in fact unnecessary. This determination is analogous to proving that an alleged therapeutic procedure, such as an operation, was unnecessary. To establish liability for such an operation, a plaintiff must show that the operation was unnecessary, that the physician was derelict in his duty in that he knew or should have known that the operation was not necessary, that the resulting surgical harm was in fact a detriment to the plaintiff, and that the plaintiff was deceived regarding the necessity of the operation.[15]

Unfortunately, the determination that a test was unnecessary cannot be resolved by a finding that the results of the test were negative; the great majority of diagnostic tests yield negative results, but these findings are often as significant and important medically as a positive result. Probabilities could be assigned to the value of the tests;

13. B. Ficarra, "Medical Negligence Based on Bad Faith, Breach of Contract, or Mental Anguish," *Legal Medicine 1980*, ed. C. H. Wecht (Philadelphia: Saunders, 1980), pp. 187–206 (hereafter cited as "Bad Faith").

14. See B. Ficarra, *Surgical and Applied Malpractice* (Springfield, Ill.: Thomas, 1968).

15. Ibid., p. 36.

however, a physician has no set guidelines as to what statistics would warrant a cautionary diagnostic inquiry. A doctor's decision to pursue a course of diagnostic procedures is based upon his patient's own philosophy as influenced by his medical training and experience. Expert witnesses can be expected to testify that because of the multiplicity of the factors involved in making diagnostic decisions, examination of a medical chart often will not reveal with reasonable medical certainty whether a physician is practicing defensive medicine.[16] Because of these numerous difficulties, it will be rare for a diagnostic test to be labeled conclusively as unnecessary.

Standard of Care

Basic to establishing a cause of action against a physician for medical malpractice is the need to demonstrate a standard of care imposed on the physician. Liability may be sustained depending on the jurisdiction, if it can be shown that the ordering of the procedures complained of was not within the acceptable standard of care existing in the same locality or in a similar community, or acceptable nationwide.[17] These are the guidelines used to measure a physician's performance in comparison with the degree of care, attention, diligence, or vigilance ordinarily exercised by physicians in the conduct of their professional work.[18]

In applying the standard of care doctrine to diagnostic procedures it is notably difficult to determine what the standard of care actually is. Although certain minimum standards or "regular" procedures exist for the diagnosis and treatment of ailments, no maximum threshold of care has ever been formulated for diagnostic procedures. What may appear to be defensive medicine to one physician may be considered high-quality medicine to another. The weighing of cost, benefits, and risk exposure in medical testing is usually left to the discretion of the physician.[19] Unless there is a drastic departure from the normal practice, establishing that a test was unnecessary or outside the standard of care imposes an extremely difficult obstacle to successful litigation in this area. In addition, some physicians argue that even if a doctor's motive is

16. Hershey, p. 74.

17. Louisell & Williams, *Trial of Medical Malpractice Cases* (New York: Mathew Binder, 1977 & Suppl. 190), pp. 200–202 (hereafter cited as Louisell).

18. Ibid.

19. See *Duke*, p. 944; Louisell, p. 203.

his own self-interest and not the interest of this patient in ordering "unnecessary" testing, this elaborate diagnostic work produces better medical care by detecting unsuspected health problems.[20] It would be extremely difficult to impose liability on a physician for defensive medicine if the test serendipitously uncovered some unsuspected problem.

Liability Theories

There are a number of legal courses of action under which a physician can be sued in the case of pure defensive-medicine negligence. The predominant theory employed in medical malpractice litigation is negligence.[21] Under this theory the patient must prove some harm or injury. To that end, the plaintiff must establish that the physician had a duty to the plaintiff to practice according to an acceptable standard of care, that there was a deviation or departure from an applicable standard of care, that a causal connection exists between the failure to conform and the harm complained of by the patients, and that damages ensued. Once the plaintiff establishes the physician-patient relationship the duty requirement will be satisfied.[22] The most difficult proof will be in establishing that the tests were in fact unnecessary or outside the accepted standard of care. Proof of the causal connection between the injury or harm and the physician's actions may also present difficulty. However, if the physician supervised or conducted the diagnostic testing, this relationship is more readily established.

The novelty of diagnostic testing is that these procedures are often carried out by others, either independent laboratories or employees of the doctor. A physician is usually not responsible for the acts of an independent contractor; the doctor is responsible, however, for referring the patient to a qualified consultant or laboratory.[23] If the technician is an employee of the physician, the doctor could be held liable under the doctrine of agency.[24]

20. See, for example, Bergen, p. 1188.

21. See "Bad Faith," p. 199; Louisell, p. 194.

22. See "Bad Faith," p. 194; Louisell, p. 191.

23. See "Bad Faith," p. 192; see also Hirsh, "Duty to Refer and Consult," *Legal Medicine Annual 1977*, ed. C. H. Wecht (New York: Appleton-Century-Crofts, 1977), pp. 247–56.

24. See McConnell v. Williams, 361 Pa. 355, 65 A. 2nd 243 (1949); see also B. Ficarra, *Surgical and Allied Malpractice* (Springfield, Ill.: Thomas, 1968), p. 722.

Breach of Implied Contract

Breach of implied contract could be another basis of legal action which would be available to a plaintiff injured by the practice of defensive medicine. The fact that a physician-patient relationship gives rise to an implied contract was recognized as early as 1853 in *Leighton v. Sargent*.[25] In such an agreement, a physician contracts that:

> he possesses that reasonable degree of learning, skill, and experience which is ordinarily possessed by the professors of the same art of science,... that he will use reasonable and ordinary care and diligence in the exertion of his skill and the application of his knowledge.... In diligence and care, the medical and other professional men contract to use their best judgment.[26]

Most actions for breach of implied contract assert a failure to use reasonable and ordinary care and diligence, but the practice of defensive medicine would also be a deliberate or knowing violation of a physician's duty to use his best judgment on behalf of his patient-employer. Even if the practice of defensive medicine usually resulted in beneficial consequences,[27] liability could still be established under an implied contract theory by showing that the physician's orders were motivated exclusively or primarily by fear of litigation. This could be shown by the use of expert-witness testimony, or, even by an admission by the physician. The breach of the implied contract is proven when it can be shown that the best judgment of the doctor could not possibly include testing which he himself knew or should have known was unnecessary and which might expose his patient to pain and suffering, risk, and extra costs.

Historically, substantial damages have not been recoverable under an implied-contract theory, but this prohibition has been eased in many jurisdictions.[28] An award of damages in any contract action can be very significant, however, depending upon the individual circumstances of the plaintiff. Usually the actual measure of damages is calculated by placing the plaintiff back in his original pre-contractual position.[29] Clearly

25. 27 N.H. 460, 59 Am. Dec. 388 (1853).

26. Ibid.

27. See Bergen, pp. 1188–89.

28. See Louisell, p. 198.

29. Miller, "The Contractual Liability of Physicians and Surgeons," *Washington University Law Quarterly* (1953): 413–32; also see Simonaitis, "Guarantee of Medical Results," *Journal of the American Medical Association* 219 (1972): 431–32.

if a plaintiff sustains substantial injury this measure of damages would be very desirable. Some states do not allow breach of implied contract suits as a basis for medical malpractice action.[30]

Bad Faith

Since *Rothe v. Shell Oil Co.* was first decided in 1960, actions based on bad faith have multiplied.[31] Although the majority of these suits have been against insurance carriers, a physician's contract with his patients includes an implied covenant of good faith and fair dealings.[32] If a physician misrepresents the purpose of ordering a procedure in his own self-interest, an action based on fraud or deceit could be maintained. It is unlikely that a doctor would reveal to a patient that his motive for having the patient undergo certain tests is to protect himself from a liability action, and not for the patient's benefit. This failure to so inform a patient could clearly fall within the framework of fraud and deceit.

Battery

Because the ordering of tests and treatment is an intentional act, a plaintiff-patient could also bring an action for the tort of battery. Even if a consent form was signed which indicated that the diagnostic procedure was merely precautionary, the physician's failure to reveal that his motive and purpose in ordering tests was to avoid litigation could be held to be a material fact which should have been disclosed to the plaintiff for his consideration. Failure to reveal a material fact has the effect of nullifying the consent.[33] Without the presence of a knowledgeable consent there is no assent by the patient to accept the prescribed medical care. The prescribing of tests for the purpose of defensive medicine would be outside the reasonable scope of a patient's consent whether the consent was expressed or implied, because it could only be rationally assumed that the patient was consenting to treatment

30. See "Bad Faith," p. 193, note 10.
31. 185 App. 2d 676, 8 Cal. Rptr. 514 (1960); see "Bad Faith", p. 193, note 10.
32. See "Bad Faith," p. 193, note 2.
33. See c.f., de May v. Roberts, 9 N.W. 146 (Mich. 1887).

in his own best interests and not in the best interests of his physician. If a physician exceeds the scope of consent, he will be held liable for tort of battery whether or not the procedure was in the patient's best interests.[34]

Breach of Fiduciary Duty

Another cause of action upon which relief could be granted would be for breach of fiduciary duty arising out of the physician-patient relationship. Although this relationship is usually not labeled a fiduciary one, it is in effect indistinguishable from the classic definition of fiduciary. *Black* defines a fiduciary relationship as faith, confidence, trust, and special reliance placed in one, with the fiduciary bound to act in equity and good faith for the one who reposed the confidence.[35] In the typical situation a patient places his trust in his physician, who is given the authority to make the patient's medical decisions based on his expertise and his relationship with the patient. Because there is this fiduciary relationship, the doctor should be held liable for any damages resulting from his breach of this duty. It has been proffered that the *corpus* of the relationship between physician and patient should be the patient himself and not the patient's finances.[36] Although there obviously is a financial aspect, the relationship of trust and confidence is not limited to money. With the establishment of a fiduciary duty, liability could be established if the physician were shown to be practicing defensive medicine; such a motive for ordering diagnostic or other procedures would clearly be a breach of the obligation to act in the best interests of the patient.

Future of Litigation

Although the practice of defensive medicine is a form of malpractice, successful litigation will be rare. To establish that a diagnostic procedure was outside the standard of care or that a physician was motivated by the avoidance of malpractice litigation is a formidable if not unsurmountable barrier. Additionally, to find expert witnesses who would be willing to testify against fellow physicians, and who would definitively assert a finding of defensive medical practice, would be extremely difficult.

34. See c.f., Mohr v. Williams, 104 N.W. 12 (Minn. 1905).

35. *Blacks Law Dictionary*, ed. J. R. Nolan and M. J. Connolly, 5th ed. (St. Paul: West, 1979), p. 564.

36. See c.f., Nicola, "Medical Malpractice," *Ohio State Law Journal* 25 (1964): 378–80; Louisell, p. 203.

Solutions

One possible way to reduce the practice of defensive medicine would be to establish an absolute requirement of informed consent. If a physician were required to justify these procedures or to account for them to his patient, the abuse of this discretion should be reduced. In the extreme, some suggest that patients be supplied cost-benefit information; more decision-making could be allocated to them and this at the same time would reduce the fears of malpractice litigation. Both of these solutions, however, would involve great burdens on the medical profession and special costs in themselves.

The most effective way to combat the spread of defensive medicine would be to provide greater awareness that this practice probably does not accomplish its purpose. It does not significantly reduce the threat of malpractice litigation. Data from the National Association of Insurance Commissioners, reported in *Malpractice Claims Survey*, reveal that only 2% of all medical malpractice claims were based on inadequate diagnostic procedures, whereas 13% of the liability claims resulted from delays in medical treatment.[37] If, as this study indicates, defensive medicine does not protect the physician effectively, and if physicians become aware of such a fact, it is very improbable that defensive medicine would continue to any significant extent.

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37. See Hayes, pp. 267–68.

American Manners, Customs, and Conditions in 1841

SEPT. 27. 1841.—We embarked once more on the Hudson, to sail from Albany to New York, with several hundred passengers on board, and thought the scenery more beautiful than ever. The steamboat is a great floating hotel, of which the captain is landlord. He presides at meals, taking care that no gentlemen take their places at table till all the ladies, or, as we should say in England, the women of every class, are first seated. The men, by whom they are accompanied, are then invited to join them, after which, at the sound of a bell, the bachelors and married men travelling *en garçon* pour into the saloon, in much the style as members of the House of Commons rush into the Upper House to hear a speech from the throne.

One of the first peculiarities that must strike a foreigner in the United States is the deference paid universally to the sex, without regard to station. Women may travel alone here in stage-coaches, steam-boats, and railways, with less risk of encountering disagreeable behavior, and of hearing coarse and unpleasant conversation, that in any country I have ever visited. The contrast in this respect between the Americans and the French is quite remarkable. There is a spirit of true gallantry in all this, but the publicity of the railway car, where all are in one long room, and of the large ordinaries, whether on land or water, is a great protection, the want of which has been felt by many a female traveller without escort in England. As the Americans address no conversation to strangers, we soon became tolerably reconciled to living so much in public. Our fellow-passengers consisted for the most part of shop-keepers, artizans, and mechanics, with their families, all well dressed, and so far as we had intercourse with them, polite and desirous to please. A large part of them were on pleasure excursions, in which they delight to spend their spare cash.

On one or two occasions during our late tour in the newly-settled districts of New York, it was intimated to us that we were expected to sit down to dinner with our driver, usually the son or brother of the farmer who owned our vehicle. We were invariably struck with the propriety of their manners, in which there was self-respect without forwardness. The only disagreeable adventure in the way of coming into close contact with low and coarse companions, arose from my taking places in a cheap canal-boat near Lockport, partly filled with emigrants, and corresponding somewhat in the rank of its passengers with a third-class railway-carriage in England. "Que diable allait-il faire dans cette galère?" would have been a difficult question for me to answer, especially as I afterwards learnt that I might have hired a good private carriage at the very place where I embarked. This convenience indeed, although there is no posting, I invariably found at my command in all the states of the Union, both northern and southern, which I visited during my stay in America.

Travellers must make up their minds, in this as in other countries, to fall in now and then with free and easy people. I am bound, however, to say that in the two most glaring instances of vulgar familiarity which we have experienced here, we found out that both the offenders had crossed the Atlantic only ten years before, and had risen rapidly from a humble station. Whatever good breeding exists here in the middle classes is certainly not of foreign importation; and John Bull, in particular, when out of humour with the manners of the Americans, is often unconsciously beholding his own image in the mirror, or comparing one class of society in the United States with another in his own country, which ought, from superior affluence and leisure, to exhibit a higher standard of refinement and intelligence.

We have now seen the two largest cities, many towns and villages, besides some of the back settlements of New York and the New England States; an exemplification, I am told, of a population amounting to about five millions of souls. We have met with no beggars, witnessed no signs of want, but everywhere the most unequivocal proofs of prosperity and rapid progress in agriculture, commerce, and great public works. As these states are, some of them, entirely free from debt, and the rest have punctually paid the interest of Government loans, it would be most unjust to apply to them the disparaging comment "that it is easy to go ahead with borrowed money." In spite of the constant influx of uneducated and pennyless adventurers from Europe, I believe it would be impossible to find five millions in any other region of the globe whose average moral, social, and intellectual condition stands so high. One convincing evidence of their well-being has not, I think, been sufficiently dwelt upon by foreigners: I allude to the difficulty of obtaining and retaining young American men and women for a series of years in domestic service, an occupation by no means considered as degrading here, for they are highly paid, and treated almost as equals. But so long as they enjoy such facilities of bettering their condition, and can marry early, they will naturally renounce this bondage as soon as possible. That the few, or the opulent class, especially those resident in country places, should be put to great inconvenience by this circumstance, is unavoidable, and we must therefore be on our guard, when endeavouring to estimate the happiness of the many, not to sympathize too much with this minority.

I am also aware that the blessing alluded to, and many others which they enjoy, belong to a progressive, as contrasted with a stationary, state of the society;—that they characterize the new colony, where there is abundance of unoccupied land, and a ready outlet to a redundant labouring class. They are not the results of a democratic, as compared with a monarchical or aristocratic constitution, nor the fruits of an absolute equality of religious sects, still less of universal suffrage. Nevertheless, we must not forget how easily all the geographical advantages arising from climate, soil, fine navigable rivers,

splendid harbours, and a wilderness in the far West, might have been marred by other laws, and other political institutions. Had Spain colonized this region, how different would have been her career of civilisation! Had the puritan fathers landed on the banks of the Plata, how many hundreds of large steamers would ere this have been plying the Paraná and Uruguay,—how many railway-trains flying over the Pampas,—how many large schools and universities flourishing in Paraguay!

Charles Lytell, *Travels in North America; with Geological Observations on the United States, Canada, and Nova Scotia* (London: Murray, 1845), 1: 70–75.

The General Accounting Office Looks at the Nation's Health

MURRAY GRANT

THE United States General Accounting Office (GAO) was created by the Budget and Accounting Act of 1921. It is headed by the Comptroller General of the United States, who is nominated by the President and approved by the Senate for a term of 15 years. It was the intent of the Act of 1921 that the General Accounting Office function independently of the Executive Branch and be responsible only to the Congress. Its basic function is to investigate and report to the Congress on all matters pertaining to the receipt, disbursement, and application of public funds; it makes recommendations looking to greater economy and efficiency in public expenditures.

In recent times the General Accounting Office has placed increased emphasis on professional audits and evaluations of Governmental programs as opposed to the mere checking of financial details. It currently supports some 6,000 staff members, of whom approximately 4,000 are professional employees mostly representing the fields of accountancy and business. However, in recent years it has recruited a number of specialists in areas such as economics, energy and education, and engineering and systems analysis. In 1973 a physician was appointed to assist the office in its audits of health programs.

In addition to the main General Accounting Office Building in Washington, staff members are assigned to many audit sites within or adjoining federal government buildings in the Washington-Baltimore area. Further, regional offices are maintained in 15 major cities throughout the country, as well as one in Europe, one in Latin America, and a sub-office in the Far East.

Approximately half of the program audits performed by the General Accounting Office are requested or mandated by Congress, by a Congressional committee, or in some cases, by individual congressmen. The other GAO audits are self-initiated, that is, they are developed by the GAO staff in response to a perceived need for investigation of a particular area of activity. Even in these instances, the usual practice is to check with one or more congressional committees in order to determine the extent of their interest.

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Once a program audit has begun, the usual procedure is for a number of staff members to be assigned, some from the central office in Washington, and usually, some from one or more regional offices. A legislative and, in some instances, a literature search is initiated; then field work begins. During the latter phase interviews may be held with appropriate individuals or organizations and, in many cases, detailed reviews of agency records are carried out. These audits usually take several months and, as a rule, culminate in a written report which is transmitted both to the appropriate federal agency and to the Congress.

It will be readily appreciated that many federal agencies have some involvement in the health field. Clearly, the major agency in terms of dollars and programs is the Department of Health and Human Services. However, the Veterans Administration and the Department of Defense have extensive health activities, while the Environmental Protection Administration is now the predominant agency in environmental health. Furthermore, the Departments of Agriculture, Labor, and Transportation all have involvement in health. Accordingly, reviews of health programs by GAO involve many agencies.

In 1974, for example, the General Accounting Office examined the use of diagnostic reagents because of the possibility that some of these products might be unreliable and hence might produce inaccurate test results which could be damaging to health. Both *in vivo* and *in vitro* products were reviewed. We found that a number of unreliable *in vitro* diagnostic substances were being sold in the United States and were being exported to foreign countries. We asked the Centers for Disease Control to test samples of such products in order to determine their reliability. They judged that 25% of the diagnostic test results were unreliable and possibly resulted in unnecessary medical treatment or in the withholding of necessary treatment. As a result of this review we felt that the Administration's efforts to regulate diagnostic products were inadequate and we recommended that the Food and Drug Administration take steps to strengthen its control over *in vitro* diagnostics. We also suggested that Congress enact legislation giving the Federal Government more authority in this area.

Two years later the General Accounting Office issued a report on medical problems of civilian pilots. Our concern was with the more than 200 million airline passengers each year who depend on the medical fitness of pilots and crews. In that report we noted an instance in which 83 passengers were killed when a pilot in command of a

chartered aircraft suffered a heart attack while attempting to land. He had a history of heart disease and diabetes. We pointed out also that in the ten years ending in 1975 there were 600 accidents due to death or incapacitation of pilots. We found that despite medical studies which urged more extensive medical screening of pilots, the Federal Aviation Administration had adopted few of those recommendations. We recommended that the Federal Aviation Administration require periodic resting electrocardiograms of all pilots and that consideration be given to blood cholesterol levels and to the use of tobacco when pilots were being examined.

In the fall of 1976 we witnessed an unprecedented venture on the part of the Federal Government, namely the establishment of a nationwide program of immunization against swine influenza, aimed ostensibly at preventing a major epidemic. No such outbreak occurred! Officials for the Department of Health, Education and Welfare had estimated that the vaccine would protect adequately about 70 to 90% of persons vaccinated. However, previous experience with influenza vaccines revealed wide differences of opinion in regard to the amount of protection that they afford. In this effort it became clear that for persons under the age of 24 years, antibody responses were usually less than desired. The problem was compounded by the fact that, in spite of the March 1976 estimate by the Department of Health, Education and Welfare that manufacturers could produce and deliver 200 million doses of vaccine by the end of November, primarily because of unresolved liability questions, the first delivery was delayed until October; at that time, sufficient vaccine was on hand to immunize only about 12% of the population. Furthermore, state and local immunization programs were not ready to begin operations by July. This resulted from several factors, including the tardiness of federal vaccine recommendations, the limited and delayed delivery of vaccine, and the lack of state liability insurance. Our report, which was issued in June 1977, was designed to determine what could be learned from this massive immunization effort, and we hoped it would be applicable to any future campaign.

Early in 1977, the General Accounting Office was asked to investigate the Veterans Administration plans to construct a new hospital in Camden, New Jersey. The Veterans Administration used as its primary basis for justifying the hospital an analysis of veterans' medical records in the Philadelphia area. However, we found that some of these

assumptions were invalid. It was our view that the Philadelphia Veterans' Hospital, located about 7 miles from the site of the proposed new Camden Hospital, was large enough to support the entire 1985 medical and surgical requirements of veterans in the area. Accordingly, we recommended against construction of the Camden facility, thus saving approximately $70 million in construction costs and $32 million annually in operating expenses. As of this date the Camden Hospital has not been built.

Later that year the General Accounting Office was requested to study the capitation support provided to medical schools. To accomplish this task, we visited 11 medical schools, both public and private, and found that capitation funding constituted only a minor portion of the funds received by each school. We noted, however, that capitation funds helped provide great flexibility to medical schools as regards the types of programs and activities for which they could be used. Further, we indicated that, beyond the possibility of increases in tuition fees, there was little if any opportunity for replacement of these funds should capitation support be terminated. One consequence, however, could be a reduction in the number of low and middle income students.

In 1978 the General Accounting Office issued a report commenting on the extent to which prepaid health delivery systems could be successful. This followed an analysis of 14 health maintenance organizations across the country. One of our major concerns had to do with the likelihood that these entities could remain financially viable. We also noted that they had not usually enrolled many elderly or indigent persons. Therefore, many at high medical risk had been excluded from membership. We recommended a number of legislative changes to deal with these difficulties.

During the same year the General Accounting Office issued a report that dealt with 16 problems in air and water pollution. This report attempted to address such questions as "how much environmental protection is needed; what is the best way of obtaining it and what price is the nation willing to pay." Our purpose was to identify strengths and weaknesses in pollution control programs and to suggest possible alternative strategies that might be used to attain proper goals. We also pointed out that energy consumption is a major contributor to air and water pollution but it was not clear that this had been recognized sufficiently.

For some time there has been wide agreement within the medical profession concerning the need to train more primary-care physicians. In May 1978 the General Accounting Office issued a report after a review aimed at exploring this question as well as the additional problem of the extent to which we have been training too many specialists in certain categories. We pointed out that little was being done to match the training of future physicians to the medical needs of the country. We observed that too many physicians are being trained in some specialties and too few in primary care. We noted the steady decline in the percentage of practicing physicians engaged in primary care since 1931 and compared this to the situation in the United Kingdom, where more than 75% of all physicians are engaged in primary care. Among the specialties in which a surplus was apparently being created were surgery, cardiology, neurosurgery, and urology. We commented on the difficulties involved in arriving at a determination as to whether or not there was an adequate supply or an oversupply of physicians in the United States. We also noted that decisions on the types and sizes of graduate medical training programs were usually made by individual program directors in hundreds of medical schools and hospitals, not on the basis of any perceived national need but rather on the availability of funds, the need to provide balanced training within the medical school, and the needs of educational institutions with respect to the care of patients.

In June 1978 we issued a report after a review of the Department of Health, Education and Welfare's neighborhood health center program. This program is designed to provide outpatient health care services to about 45 million Americans who were judged to lack adequate access to health care services. The Department was funding 112 such health centers, primarily in urban areas, at a cost of approximately $200 million a year. An examination of this program revealed that many health centers were overstaffed for the number of patients being treated, and that the demand for health services from these centers was not likely to increase beyond the current level and might even decline. We also felt that there was no assurance that persons who use the centers are always residents of medically underserved areas. We recommended a number of changes designed to reduce staffing levels, to control costs, and to improve the keeping of records.

In August 1978 the General Accounting Office issued a report which explored the geographical distribution of physicians and the progress

made in improving availability of physicians in medically underserved areas. We also reviewed the factors used by newly established physicians in selecting locations for their practices and we reviewed projects which rely on physician assistants or nurse practitioners to increase the availability of health care. In addition we looked at the development of the National Health Service Corps and noted that many physicians placed in that program were being underutilized. We raised questions concerning the extent to which an unmet demand for medical care really existed in some of the areas in which these physicians had been placed. We also explored the newly established family medicine training programs and commented that these programs offer potential for increasing the supply of physicians in rural areas and small towns because of the tendency of many family practitioners to locate in such areas. One of our recommendations was to require communities seeking National Health Service Corps physicians to conduct studies in order to ascertain the approximate number of residents who would probably seek care if a physician were assigned to the area.

Late in 1977 the Veterans Administration began to receive compensation claims from veterans who felt that some of their medical problems were caused by exposure to herbicides in Vietnam. These substances had been used by the Department of Defense from 1962 to 1971 for defoliating trees and plants and to destroy food crops of hostile forces; agent orange was the herbicide most widely used. The General Accounting Office became involved in a review of this problem and found that very little information was available on the long-term health effects of herbicides. We recommended that the Department of Defense should conduct a survey of any long-term medical effects on exposed military personnel and coordinate its efforts with the Veterans Administration.

With the number of radiation-emitting sources constantly increasing, assurance against unnecessary exposure has been a matter of growing concern. The General Accounting Office surveyed the radiation control programs of three federal agencies and eight states and found that no comprehensive program existed to protect the public from the hazards presented by radiation. We noted in our 1979 report that many radiation sources and users were not regulated and that few inspectors addressed the sources of radiation.

Also in 1979, we reported on the validity of claims made by professional standards review organization with respect to cost savings

resulting from their activities. We found significant deficiencies in the data used to compute these estimates; accordingly, we felt that the reported savings were highly questionable.

In the same year we reported on the system used to certify hospitals under the medicare program and commented extensively on the important role played by the Joint Commission on Accreditation of Hospitals (JCAH). We felt that, compared to JCAH survey products, the state findings were unreliable. Many significant deficiencies identified in the Commission's reports were not detected by the states. Therefore, states had recertified hospitals that did not meet statutory and other requirements. Further, since survey teams varied from state to state in size, composition, qualifications, and training, disparate survey results were common. We recommended that the Department of Health, Education and Welfare should contract with the Joint Commission on Accreditation of Hospitals to conduct all certification surveys and not use state agencies for this purpose.

In April 1979, we reported on the use of water fluoridation to reduce dental decay. We pointed out that although a national caries program was established in 1971 to do research on the prevention of dental decay, no measurable decrease in the national incidence had occurred. Furthermore, we questioned some of the research expenditures, pointing out, for example, that $2 million had been spent to demonstrate the value of mouth-rinsing even though this technique was already known to be effective and had been marketed commercially in 40 states. We suggested that greater emphasis was needed on the promotion of water fluoridation—a proven, cost-effective technique for reducing decay.

In September 1979 we issued a report comparing physicians' charges under private health insurance plans and under Medicare. We found that physicians usually charged Medicare patients the same fees as other patients. However, the Medicare Program usually allowed less for physicians' services than did private health insurance plans.

In May 1980 the General Accounting Office issued a report on the procedures used by the Food and Drug Administration to license drugs. This report followed long-standing accusations which implied the existence of a "drug-lag." Many had contended that important innovations in medication were precluded from entering the United States market. Before writing this report the General Accounting Office made a detailed study of the Food and Drug Administration's drug approval process. Visits were also made to Canada and to eight

European countries in order to compare the licensing procedures used in these countries with those in the United States. The report indicated that the Food and Drug Administration's approval process was lengthy and that it often took as long to approve an important drug as to approve drugs of much less importance. We stated that, in our view, this lengthy process delayed the benefits which important drugs can provide to the public. We also pointed to a number of important drugs which were approved in some foreign countries in less time than in the United States and stated that, except for Sweden, approval times in the countries we visited were much shorter than in the United States. Finally, we noted that several very useful drugs were available in foreign countries years before they were licensed in this country. Among these were sodium valproate, propranolol, and disopyramide. A recent example of this is chymopapain, which has only recently been made available in the United States for the treatment of lumbar-disc syndrome although it has been generally available in Canada for many years. Our recommendations both to the Food and Drug Administration and to Congress were geared to acceleration of the drug-approval process while still maintaining control over safety and efficacy.

Also in 1980 we issued an extensive report on the use of dental assistants; our specific interest was in individuals known as expanded function dental auxiliaries. We found much evidence attesting to the value of these persons in increasing the efficiency of the nation's dental care delivery system while providing needed services to more persons at lower cost. We pointed out, nevertheless, that most states prevented dentists from employing these persons and we recommended changes in state laws to permit their employment. We also suggested that consideration be given to expanding their availability in federal agencies when they could prove cost-beneficial.

Toward the latter part of the 1970s, evidence began to accumulate that proprietary medical schools were being established in some foreign countries, especially in the Caribbean area. Their purpose appeared to be to cater to United States students who had been unable to secure admission to United States medical schools. Because of the implications of this practice and with recognition of the fact that some of these students studying medicine in foreign schools were being supported in part by United States funds, the General Accounting Office launched a major examination of this subject. As part of this review we visited six medical schools in the Caribbean, Mexico, and Europe where United

States students either were studying or had at one time studied in great numbers. Some of these were long-established institutions; others were recent. During our visits we examined into the facilities, staff, and curriculum of each school and met both faculty members and students. We also visited a number of hospitals in the United States where some of these students received part of their clinical training. We reported our findings and recommendations in November 1980. Our report indicated our belief that a better way was needed to insure that all students who attended foreign medical schools were able to demonstrate that their medical knowledge and skills were comparable to those of their United States-trained counterparts before they were allowed to enter the mainstream of American medicine. It was our view that, in the case of the six foreign schools we visited, none offered a medical education comparable to that available in the United States. This was the result of deficiencies in admission requirements, facilities and equipment, faculty, curriculum, or clinical training. The most serious shortcoming was the lack of adequate facilities for clinical training. It was because of this that many of the United States students endeavored to secure part of their undergraduate clinical training in United States hospitals. However, many of these were not teaching hospitals and the type, length, and extent of training that the students received varied widely.

In September 1980 the General Accounting Office issued a report which explored the reasons for rising hospital costs and suggested ways to try to restrain this rise. We pointed out that between 1950 and 1978, health care expenditures increased 1,500%, the largest portion of this increase being accounted for by hospital costs. While we recognized the contribution made by general inflation, we pointed out that many other factors were involved, including the method of hospital reimbursement, advancing medical technology, and patient-demand stimulated, at least in part, by third-party payment. We suggested that improvements in hospital management would contain some of these costs but we pointed out that incentives needed to be developed to encourage this. Among possible improvements were shared services and conservation of energy. We recommended a greater exploration of prospective reimbursement systems because it was our judgment that they offer the prospect of creating incentives in a way that the present system of retrospective reimbursement cannot. In this connection, one may note the current interest in prospective reimbursement and the general support that it appears to be receiving within the present Administration.

In 1980, also, we reported on an examination we had performed to determine why hospitals in the same geographical area often paid widely different prices for similar supplies. For example, in Seattle we found that one hospital paid $2.42 for a cylinder of oxygen while another paid $5.37. In Cincinnati one hospital paid $3.19 for irrigating solution that cost another hospital $1.17. We found no definite reason for this variation. Obviously, these prices are transferred to the consumer or third-party payer, including the Federal Government.

In 1981 we issued a report which examined the extent to which programs established by the Federal Department of Health and Human Services were set up on the basis of assessment of needs. We used as an example the rural and urban health center programs which were implemented in 1975 and 1977 respectively. We questioned whether realistic efforts had been made to establish the need for some of these centers and we noted that eleven of eighteen grantees we examined were serving areas that may no longer qualify as medically underserved. Eleven of thirty grantees we visited had drawn their proposed service boundary lines so as to exclude existing services. Very few of the grantees visited by GAO had assessed the expected demand for services; 58% of these centers that had been in operation for more than 2 years did not meet Federal productivity standards. We further observed that the same lack of assessment of needs permeated many other health-care grant programs. In this connection, we specifically mentioned alcohol, drug abuse, and mental health grant programs as well as the National Health Service Corps.

In June 1981 we issued a report which attempted to address the question whether or not there would be enough trained medical personnel in the event of a war. In the report we pointed out that the Department of Defense estimates show that a severe shortage of physicians, nurses, and enlisted medical personnel would begin to occur soon after mobilization. Shortages of surgical personnel would be particularly critical because requirements of theaters of operations could not be met. We proposed a number of alternatives to help overcome shortages of medical personnel after mobilization.

From April 1975 through February 1982 about 1.4 million Indochinese fled their homelands; of these, approximately 580,000 resettled in the United States. Federal law mandates that migrants with certain physical or mental ailments be debarred from entering the country. Included among those ailments are several contagious diseases, such as active

tuberculosis and infectious leprosy. Evidence had accumulated that considerable numbers of refugees were, in fact, entering this country with some of these diseases. Because of the possible impact this could have upon the people of the United States, the General Accounting Office examined the situation and issued a report in August 1982. We found that overseas medical examinations of these refugees were cursory and inadequate. As a result, serious contagious diseases as well as other medical problems went undetected and untreated. These problems became difficult to deal with once refugees became dispersed into the United States population. Further, there is clear evidence that the incidence of many serious communicable diseases among the Indochinese refugees in this country is much higher than among the rest of the United States population; among these are active tuberculosis, leprosy, certain parasitic diseases, hepatitis B, and malaria. It was our view that as the reservoir of some of these diseases becomes larger, the possibility of spread in the population increases. Accordingly, we made several recommendations primarily looking to improvement in the overseas program of medical examination and treatment.

The foregoing is a sample of reports affecting the nation's health issued by the General Accounting Office during the past few years. It is designed to demonstrate the broad variety of subjects examined by the Agency covering the health field. It is also clear that some of these reports could result in changes which may have a strongly favorable effect on physicians, hospitals, and others engaged in furthering the nation's health.

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Alligators in Georgia

WHEN our canoe had proceeded into the brackish water, where the river banks consisted of marsh land covered with a tall reed-like grass, we came close up to an alligator, about nine feet long, basking in the sun. Had the day been warmer, he would not have allowed us to approach so near to him; for these reptiles are much shyer than formerly, since they have learnt to dread the avenging rifle of the planter, whose stray hogs and sporting dogs they often devour. About ten years ago, Mr. Couper tells us, that he saw 200 of them together in St. Mary's River, in Florida, extremely fearless. The oldest and largest individuals on the Altamaha have been killed, and they are now rarely twelve feet long, and never exceed sixteen and a half feet. As almost all of them have been in their winter retreats ever since the frost of last month, I was glad that we had surprised one in his native haunts, and seen him plunge into the water by the side of our boat. When I first read Bartram's account of alligators more than twenty feet long, and how they attacked his boat and bellowed like bulls, and made a sound like distant thinder, I suspected him of exaggeration; but all my inquiries here and in Louisiana convinced that he may be depended upon. His account of the nests which they build in the marshes is perfectly correct. They resemble haycocks, about four feet high, and five feet in diameter at their bases, being constructed with mud, grass, and herbage. First they deposit one layer of eggs on a floor of mortar, and having covered this with a second stratum of mud and herbage eight inches thick, lay another set of eggs upon that, and so on to the top, there being commonly from one hundred to two hundred eggs in a nest. With their tails they then beat down round the nest the dense grass and reeds, five feet high, to prevent the approach of unseen enemies. The female watches her eggs until they are all hatched by the heat of the sun, and then takes her brood under her care, defending them, and providing for their subsistence. Dr. Luzenberger, of New Orleans, told me that he once packed up one of these nests, with eggs, in a box for the Museum of St. Petersburgh, but was recommended, before he closed it, to see that there was no danger of any of the eggs being hatched on the voyage. On opening one, a young alligator walked out, and was soon after followed by all the rest, about a hundred, which he fed in his house, where they went up and down the stairs, whining and barking like young puppies. They ate voraciously, yet their growth was so slow, as to confirm him in the common opinion, that individuals which have attained the largest size are of very great age; though whether they live for three centuries, as some pretend, must be decided by future observations.

Charles Lytell, *A Second Visit to the United States of North America* (New York: Harper, 1849), 1: 250–52.

George Catlin on Mouth Breathing*

SYLVAN E. STOOL

IN recent years the literature of clinical medicine has evidenced an increase of interest in the consequences of tonsillar and adenoidal hypertrophy. This fact impelled the author to review the earlier literature on the subject. Mrs. Lizabeth Holloway, formerly curator of the historical collections at the College of Physicians of Philadelphia, directed his attention to an essay by Joseph H. Bryan,[1] which states that George Catlin (1796–1872), noted painter of the American Indian, was the first in North America to call attention to mouth breathing. This was an allusion to Catlin's book *The Breath of Life; or Mal-Respiration, and its Effects upon the Enjoyments and Life of Man,* first published in New York in 1861 by John Wiley. This work went through several editions (Fig. 1), one of which was prepared by the unfamiliar manu-graph process (London: Trübner, 1862). A regular second edition was issued by Wiley in 1864. In 1925 the volume was reprinted by Wiley at the instance of Edward H. Angle, who is regarded as the father of modern orthodontia. Most of these editions are included in the holdings of the College of Physicians of Philadelphia, the American Philosophical Society, the dental library of the University of Pennsylvania, and the personal library of Dr. Samuel X Radbill.

The son of a minor court official, George Catlin was born in Wilkes-Barre, Pennsylvania in 1796. The family lived in Pennsylvania and southwestern New York during his childhood. At this early stage Catlin became interested in American Indians and developed a degree of skill in art. At the age of 21 he was sent to law school in Litchfield, Connecticut. He subsequently practiced law for about four years. Later, abandoning the practice of law, he embarked on a career as a portrait painter, primarily of miniatures, in Philadelphia.

1. J. H. Bryan, "The history of laryngology and rhinology and the influence of Americans in the development of this specialty," *Annals of Medical History* n.s. 5 (1933): 151–70.

*Presented before the Section on Medical History, College of Physicians of Philadelphia, December 15, 1982.

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Through a series of contacts with Indians he decided to portray these tribesmen of the west. He traveled extensively among them from 1832 to 1840, producing a gallery of portraits and landscapes and collecting artifacts. After exhibiting the gallery, he attempted to sell it to the United States Congress. The offer being refused, he took the collection to Europe but he became bankrupt and was forced to sell it. His wife and son died, his daughters returned to America, and by the 1850s he was middle-aged, bankrupt, and increasingly deaf. Living in Paris, he learned at the Bibliothèque National that gold might be found in South America. Accordingly he made several trips to that continent. Indeed, his book, published in New York in 1861, apparently was completed in Brazil in 1860.

Of this very successful volume it is known that more than 40,000 copies were sold. Part of its popularity has been attributed to the fact that it contains advice on health. Charles Dodgson (Lewis Carroll) followed this advice and, in addition, is believed to have used Catlin's text as a model for the drawings and script in *Alice's Adventures in*
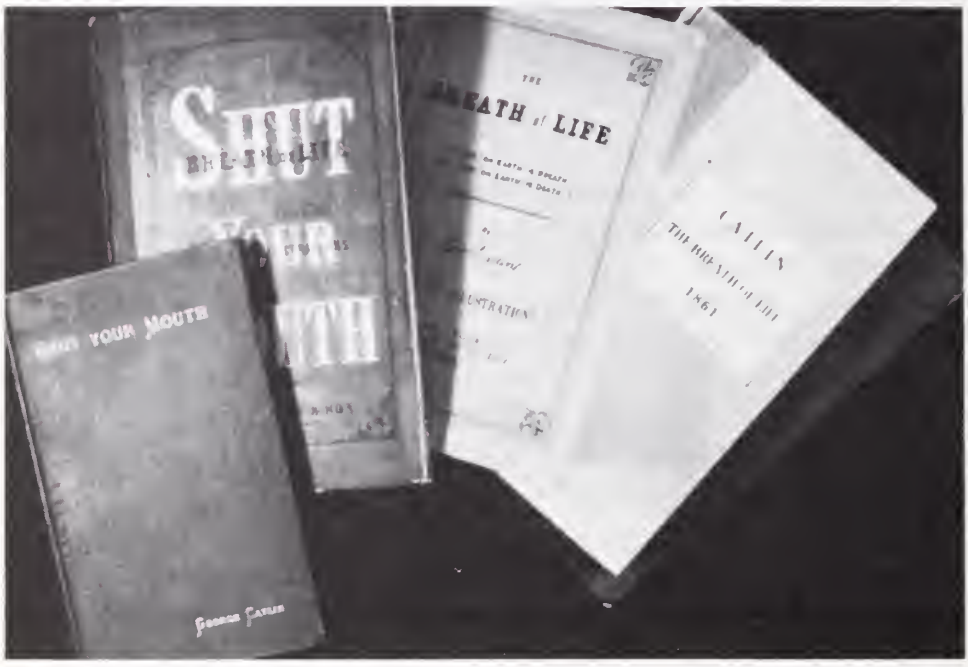
Figure 1. Various editions of *Shut Your Mouth—The Breath of Life.* Left to right: 1910 edition; 1869 edition; 1924 edition published for E.H. Angle; and 1861 (rebound).

Wonderland;[2] Catlin's text is illustrated with fantastic pen drawings which illustrate the effect of mouth breathing. Although his book did not lack favorable reviews, some of the concepts appeared radical; this attracted unfavorable criticism.

Catlin's text is not readily summarized, but some of his many interests and opinions have a claim on our attention. These are mentioned briefly in the following paragraphs.

He used the bills of mortality to illustrate the high death rate of the urban population. He states that the death rate of urban children reached 50 percent in the first five years. In contrast, during his visits to Indian tribes he was told that the only mortality among children under ten years of age was from accidents. He supported this by observing that few children's skulls were found among Indian remains.

In pursuing epidemiologic studies, he interviewed Indian chiefs who had control of more than two million persons. When he inquired whether there were any idiots or hunchbacks or any deaf or dumb people in the tribes, the chiefs replied that there were very few deformed persons such as hunchbacks. Catlin had learned of few deaf people and estimated their incidence at 0.1 percent. There were few abortions.

It had been suggested that the American Indians put their afflicted to death, hence the gene pool would be highly selective. However, Catlin states that this was not the practice; instead, deformed children were protected because they were thought to be the receptacles of an important mystery! In recent excavations of Indian remains in the upper Missouri River basin a low incidence of deformities has been noted.[3] This might be explained in several ways, e.g. that the remains of infants were not preserved by burial. Catlin's statement about infanticide is disputed by Gregg, who states that the practice existed and still exists. The question arises as to why the incidence of deformities is higher in the Indian population now than it apparently was during Catlin's time; present-day Indians, it is noted, have a much higher incidence of cleft palate than the general population. A chief named Key-Mone-Saw told Catlin that the Indians had few illnesses before the white men brought smallpox and whiskey.

2. L. Haberly, *Pursuit of the Horizon* (New York: Macmillan, 1948), pp. 208–9.

3. J. B. Gregg, et al., "Craniofacial anomalies in the Upper Missouri River Basin over a millennium: Archeological and clinical evidence," *Cleft Palate Journal* 18 (1981): 210–22.

Catlin noted the presence of infinitesimal insects in the air; if these were not filtered out by the nose, he wrote, they could affect the lungs. Moreover, if nasal mucus does not entrap foreign particles, these also could harm the lungs. Workers such as carpenters, cutlery grinders and stonemasons, obliged to work in poisonous atmospheres, should not mouth-breathe if they are to avoid pulmonary damage.

Much of Catlin's text is devoted to concepts related to nasal physiology. Catlin compares a lamb, which breathes only through the nose, with a human infant; the former, unlike the latter, can tolerate cold soon after birth. In a further reference to comparative physiology, he points out that birds which fly with their mouths open often have deposits of particles in their long bones. Catlin's work in nasal physiology has been discussed in detail by Proctor, who states that only in the past decade have scientific studies been directed at understanding the wisdom of Catlin's admonitions (see Fig. 2).[4]

Catlin made several observations on dentition and on dental disease. He observed that in the Mandans, whose skulls he saw in the famous burial circles, the teeth appeared to be without deformity, but in tribes whose diet had changed from that of the hunter-gatherer to "bread and butter," dental disease occurred. This observation has been confirmed by more recent dental authorities, who note that the hunter-gatherers have better dentition. Indeed, it is widely believed that a diet of carbohydrates promotes caries.

Catlin states that the teeth in man are amphibious and are supposed to be surrounded by saline, which rinses and removes debris. This is essential to dental health. If the mouth is open during sleep, dry air injures the oral structures, giving rise to malformation and premature dental loss, causing one to be toothless by middle age. In 1925, E. H. Angle, the eminent orthodontist, stated in his reissue of Catlin's book that he was "deeply impressed by the thoughtful manner in which the author [Catlin], so many years ago, had handled a subject that, today, is of such vital and growing interest."[5] In 1976, Dr. Wilton M. Krogman discussed the creativity of Dr. Angle and acknowledged the influence of

4. D. F. Proctor, "The nose, ambient air, and airway mucosa. A pathway in physiology," *Bulletin of the History of Medicine* 48 (1974): 352–76, (see p. 358).

5. W. H. Angle, *The Breath of Life* (reprint ed. of the Catlin work of 1861, New York: John Wiley, 1925).

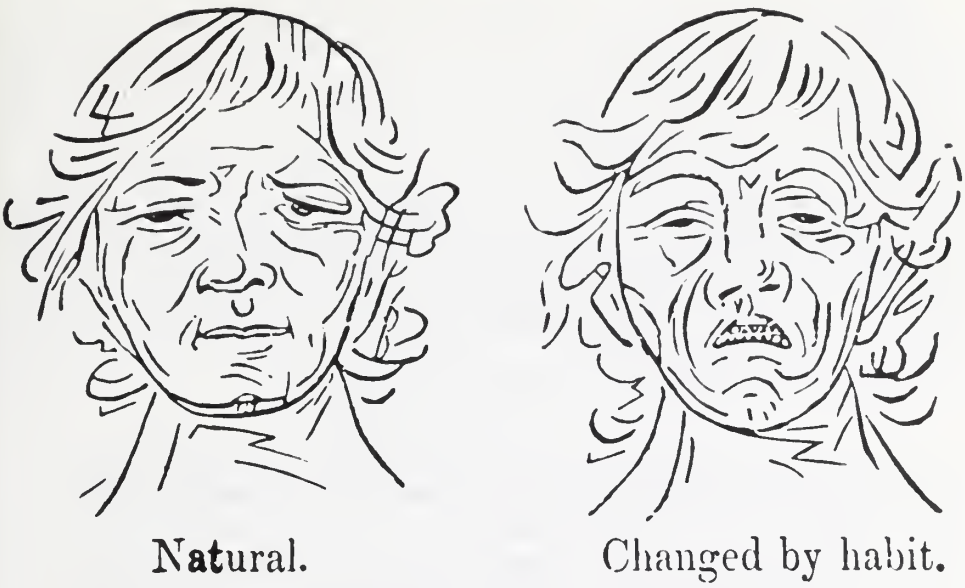

Figure 2. Changes in facial appearance caused by mouth breathing. Adapted from George Catlin's *Shut Your Mouth.*

Catlin's opinions.[6] Most authorities now agree that habitual mouth breathing, condemned by Catlin and Angle, plays a significant role in the development of malocclusion.

Catlin emphasized the importance of proper sleep and attributed a number of disturbances, such as nightmare, to mouth breathing. Recent research has supported some of his opinions on this subject.

Catlin's book refers repeatedly to the rearing of children and especially to practices associated with feeding. He repeatedly emphasizes the fact that the mother is a physician or teacher. He describes techniques of feeding in which the mother closes the mouth of the child after the breast is removed. In contrast, he discusses the bottle-fed baby of the civilized world, where the mother withdraws the nipple but does not touch the child's mouth. In consequence the child learns to mouth-breathe. In a long and rambling sermon he advises the young as to the importance of close-mouth breathing and the desirability of nasal respiration.

6. W. M. Krogman, "The creativity of Edward H. Angle. Retrospect and prospect," *The Angle Orthodontist* 46 (1976): 209–18.

While a detailed study of Catlin's development as a scientific observer is outside the scope of this article, it should be noted that he had worked for a long time as a painter whose subject-matter required exact observation. Moreover, he lived in Phildelphia during a period of intense artistic and intellectual stimulation. The newspapers of 1825–1830 show that numerous lectures on science and courses of instruction in art were available. The period, moreover, was that of the artist-naturalist, such as Audubon and the Peales. In addition it is at least possible that Catlin profited scientifically from contacts made while he was in England and France.

Dr. J. B. Gregg gives the following opinion:

> As you will note, our anthropological and archeological studies do not agree with Catlin's observations in several realms. However, we are doing the final, complete autopsy upon the human remains which are available, something he could not do. We find things that the clinicians and radiologists miss today. Catlin certainly made some careful observations relating to the physiology of the nose. Considering the fact that he had no scientific laboratory and much less specific information with which to work than we have today, he arrived at conclusions which in many instances are most valid, indicating considerable insight and deductive reasoning.[7]

While it would be easy to class Catlin as a writer of what we today call "popular science," such a verdict is not wholly just, since Catlin not only recognized a number of social and clinical problems and attempted to interpret them for the public, but he made and collected original observations in the field. Thus he had at least a few of the traits of the real scientist.

Acknowledgments

The author thanks Sandra Arjona for assistance with preparation of the manuscript and Norman Rabinovitz for assistance with photography.

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7. J. B. Gregg, personal communication, 1981.

A Sidelight on Sir Geoffrey Keynes and William Blake

FRED B. ROGERS

SIR GEOFFREY KEYNES (1887–1982), English surgeon and bibliophile, spoke about "William Blake's Illuminated Books" in Goodhart Hall at Bryn Mawr College on December 11, 1956. I attended the lecture and reception which followed as a guest of Dr. Lewis C. Scheffey, then president of the College of Physicians of Philadelphia; Edwin Wolf 2nd, the distinguished librarian, was with us.

The speaker was introduced by Professor Mary K. Woodworth of Bryn Mawr's English department. She and her sister, Allegra, then head of the history department at the Shipley School in Bryn Mawr, were friends of Sir Geoffrey and Lady Keynes, who in 1956 had moved from London to Brinkley, Newmarket, Suffolk. William Blake (1757–1827), English artist, poet, and mystic, was the subject of the evening's talk, which was illustrated with color slides. It included items from Blake's *Illustrations to the Bible;* the exposition amplified these illuminations. Through the years, Keynes and kindred spirits oversaw publication of the works of Blake in facsimile at the Trianon Press in Paris, funded by the William Blake Trust of London.

A reception at Bryn Mawr's Deanery followed the lecture. The Deanery, a gracious house, was later demolished to make way for the Miriam Coffin Canaday Library, which opened in 1970. It was a privilege for me to meet and speak with Sir Geoffrey; as it happened, I had visited Britain during the preceding summer. Keynes had spoken at Princeton University on the day before his visit to Bryn Mawr, and from there moved on to the Mayo Clinic, where he presented a series of lectures on the history of medicine.

Keynes's publications on surgical and literary subjects were numerous and varied. They ranged from writings on blood transfusion and radium therapy to bibliographies, essays, and editions of famous authors. The latter included John Donne, Sir Thomas Browne, Izaak Walton, Dr. William Harvey, John Evelyn, Ambroise Paré, John Ray, Robert Hooke, Sir William Petty, Thomas Gray, Jane Austen, William Hazlitt, Samuel Butler, Henry James, Rupert Brooke, and Siegfried Sassoon. Keynes's scholarly studies shed light and learning on human genius in several centuries. He was a man of rare taste and long purse, the master of an era.

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Described as *ultimus Romanorum* of belles lettres, Keynes celebrated his 95th birthday on March 25, 1982. His subsequent death was tersely noted in the *British Medical Journal:* "Sir Geoffrey Keynes, consulting surgeon, St. Bartholomew's Hospital, died on 5 July 1982." Many tributes followed regarding his long life and diverse accomplishments. Disciple of Sir William Osler as a medical man of letters, Geoffrey Langdon Keynes was a member of an outstanding family who added luster to its already distinguished name. I recall his personal charm with pleasure. A relevant thought from William Blake's *Jerusalem* provides appropriate approbation to this great man:

> In your own Bosom you bear your Heaven and Earth;
> and all you behold, tho' it appears Without, it is Within
> In your Imagination, of which this World of Mortality is but a Shadow.

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ESSAY-REVIEW

NEUBURGER, MAX. *The Historical Development of Experimental Brain and Spinal Cord Physiology Before Flourens.* Translated and edited with additional material by Edwin Clarke. The Johns Hopkins University Press, 1981. Price $20.00.

Reviewed by SIDNEY OCHS

THIS book by Neuburger, published in Germany in 1897, has long been a classic in the history of experimental study of cerebral and spinal function in the latter half of the 17th, the 18th, and the early half of the 19th centuries. The treatise is often quoted but has long been out of print. While a reprint was made available recently,[1] its use is limited to readers who can cope with German and with the many passages given in French and Latin. Dr. Edwin Clarke has undertaken a major service to the scholarly community by producing an excellent English translation of the German text, including all the French and Latin passages. In addition he has tracked down and corrected the original bibliographic entries, thereby removing a major weakness of the original. Moreover, he has provided extensive bibliographic entries and annotations of value to the modern reader and has added a useful biographical section on all investigators cited in the text.

To portray the riches offered in this important work, I shall review in detail a number of the topics discussed by Neuburger, noting some of Clarke's annotations and adding a few of my own. At the close I shall offer some direct evaluations of Neuburger's book.

Clarke's succinct introductory biography describes Neuburger's German-Jewish origins, his early training in Latin, Greek, other ancient and modern languages, and in history, philosophy, and medicine, followed by specialization in neurology. Neuburger was soon led by Professor Theodor Puschmann into a career in medical history, at the time when this was a little-rewarded field of endeavor. The range of information displayed in the present pioneering book is the impressive achievement of a man only 29 years old, a work which was a fitting start to Neuburger's career as one of the notable medical historians.

1. Max Neuburger, *Die historische Entwicklung der experimentellen Gehirn- und Ruckenmarksphysiologie vor Flourens* (1897; reprint ed., Amsterdam: Bonset 1967).

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The leitmotif is the evolution of knowledge of the brain based on the concept of the localization of function, determined in the main by observing the physiological effects of irritation or of lesions made in cerebral structures which were more or less well known. The development is divided into three phases. The first extends from the work of Willis (c. 1660) on the brain[2] to the time of Haller; the middle phase includes the studies of Haller and those that represent Haller's influence in the period from 1750 to 1770; the last phase extends from 1770 to the time of Flourens in the early 19th century.

Since Neuburger did not present the pre-Willisian background in a systematic or unified matter, it is appropriate to sketch those early concepts in the present essay-review. Much of what was known of brain function before Willis's time was based on philosophical concepts of mind and on imperfect knowledge of cerebral structure. Only some gross features had been apprehended by the ancients. As we find in Galen's writings, they were aware of the cerebrum and ventricles, cerebellum, the major masses, and parts readily visible to the naked eye.[3] Different faculties or functions of the soul were assigned to the ventricles. This concept was transmitted through the Galenism of medieval Arabian and scholastic philosophers, with additional exaggeration of the significance of the ventricles.[4] The anterior ventricles, in which sensory impulses terminated, were assigned the function of imagination and *sensorium commune* "common sense" (the united sensory input), the middle ventricle "judgment," and the posterior ventricle "memory," with some control over motor outflow. According to Galenic teaching, a vegetable spirit or pneuma was elaborated in the liver and present in the venous blood, a vital spirit was abstracted in the heart and was present in arterial blood, and an animal (animating) spirit was in the brain and nerves. The animal spirit was thought to be abstracted from the arterial blood in the rete mirabile at the base of the brain, to pass into the brain and its ventricles and then into the nerve fibers of the

2. Thomas Willis, *Cerebri anatome* (1664; 1681 Portdage translation reprinted in Thomas Willis, *The anatomy of the brain and nerves*, W. Feindel, ed., 2 vols. Montreal: McGill University Press, 1965).

3. W. L. H. Duckworth, *Galen on Anatomical Procedures* (Cambridge: Cambridge University Press, 1962), pp. 18–19.

4. Edward Clarke and Kenneth Dewhurst, *An Illustrated History of Brain Functions* (Oxford: Sandford Publications, 1972).

body to subserve sense and motion. The spinal cord was considered a nerve-like extension of the brain. This compressed and simplified representation does not take into account changes in the meanings of the terms. The animal spirit was viewed as more or less material and at times was thought to possess some of the attributes of a fluid. Shifts in meaning and in the recognized relation of animal spirit to the mind occurred as knowledge of bodily structures and functions developed after classical times, with modification and transmission through Vesalius and the renewal of experimental study of the brain by Willis and others during the Renaissance who attempted to account for all the known phenomena and to harmonize them.[5] The long-lasting influence of Galen in this transformation of terms was of signal importance,[6] as is indicated by the comments of Neuburger and the notes by Clarke (p. 8 and note 10, pp. 8–10; pp. 25–28; notes 7–24, p. 28; note 21, p. 254).

Ancient doctrine continued to be taught, to some extent, after Harvey described the circulation of blood in 1628. In his schematization of the mechanism by which the nervous system might operate, given the circulation of blood, Descartes retained the idea of animal spirits.[7] He visualized a flow of animal spirits projecting from sensory nerve inputs into the ventricle and onto the pineal gland, regarded as a rapidly moving structure. From this pivotal center under the control of the soul, the animal spirits were reflected into the appropriate nerve openings present in the walls of the ventricles and thence into the muscles of the body. This view was soon demolished by Steno, who was able to give fairly accurate description of cerebral structures.[8] He showed the immobility of the pineal and its position relatively remote from the sensory inputs, making the gland unsuitable for the function imagined for it by Descartes.

5. T. C. Allbutt, *Greek Medicine in Rome* (London: Macmillan, 1921); G. Verbeke, *L'evolution de la Doctrine du Pneuma du Stoicisme à S. Augustin* (Paris: DeBrower, 1945); M. Putscher, *Pneuma, Spiritus, Geist* (Wiesbaden: Steiner, 1973).

6. M. T. May, *Galen on the Usefulness of the Parts of the Body*, trans. of *De usa partium*, 2 vol. (Ithaca: Cornell University Press, 1968); R. E. Siegel, *Galen's System of Physiology and Medicine* (New York: Karger, 1968).

7. R. Descartes, *L'Homme* (1664; reprint ed., *Treatise of Man*, trans. T. S. Hall, Cambridge: Harvard University Press, 1972).

8. N. Steno, *Discours sur l'anatomie du cerveau,* (1669; reprint ed., ed. G. Scherz, *Lecture on Anatomy of the Brain*, trans. A. J. Pollock, Copenhagen: Busck, 1965).

Neuburger regarded Willis as marking the inception of experimental studies directed to fairly well-designated parts of the brain. Willis retained the concept of a flow of animal spirits, although within the substance of the brain rather than in the ventricles. He localized perception in the striate body, imagination in the corpus callosum, and memory and judgment in the cerebral convolutions. Instinct was placed in the midbrain, and the vital (unconscious) functions were relegated to the cerebellum (p. 10). Nerve spirits produced in the cerebral cortex were considered to be stored in the white (medullary) matter and then to flow in their nerve fibers by way of the cerebellum to the skeletal musculature and viscera (p. 32). Support for Willis's hypothesis was provided by clinical observations, e.g. by those of La Peyronie (p. 51), who pointed to pathological cases in which disease of the corpus callosum was found in association with mental changes.

Neuburger describes the great difficulties posed by experimental attacks designed to test Willis's hypothesis. Pressure was made on the brain (a method used by Galen), or lesions were made in the cerebellum, without appreciation of the role of the closely subjacent medulla oblongata. Experimental lesions of the cerebellum thus yielded misleading results which seemed to indicate that this organ exerted the expected control over vital functions, as indicated by cardiac changes, failure of respiration, and often by a fatal outcome. On the other hand Valsalva and Morgagni observed that damage to the cerebellum might not lead to immediate death, and Boerhaave foresaw that it was the medulla oblongata rather than the cerebellum that might be responsible for the deleterious effects seen with lesions (p. 37). The more careful extirpations carried out by Zinn, Haller's student, and by others in the middle of the 18th century (p. 43), led eventually to the recognition that the medulla oblongata—not the cerebellum—controls vital functions (p. 44).

With respect to the cerebrum, ancient clinical observations had indicated that damage to one side of the brain could affect a contralateral limb. Neuburger mentions a Hippocratic comment to this effect. In the 2nd–3rd century Aretaeus supposed a crossing of nerve fibers from the head to the body to explain contralateral signs of brain injury, by analogy to the optic chiasma. In one of his letters, published in 1710, Pourfour du Petit observed that a cortical lesion results in contralateral weakness, an effect which he ascribed to decussation of the pyramidal tract at the level of the bulb. The anonymity of Pourfour's letters and their limited distribution allowed his findings to remain in obscurity,

even until our own day.[9] Thus Gall and Spurzheim gained credit for describing the decussation of the pyramidal tract in 1801 (p. 56).

How the animal spirits or nerve fluids were supposed to move in the nerve fibers was connected to the problem of the origin of the cerebral and dural pulsations. Movements are seen after cranial wounds, when cranial openings were made by deliberate trephining; palpation of the anterior fontanelle of infants also permits movements to be detected. Such movements seemed to follow cardiac or vascular pulsations, respirations, or both. Alternatively, the dura itself was considered to cause the pulsations, an opinion advanced by Willis, Mayow, Pacchioni, Baglivi, and others in the late 17th and early 18th centuries. On this view the dura contracts to thereby drive animal spirits downward from their glandular or vascular source in the cortex into the medullary fibers of the brain, much as the heart might drive the blood (p. 78). An interesting variant concept was elaborated by Swedenborg, who considered the dura to have a mixed movement—a passive movement derived from the respiration and pulsatile impulses of the blood, and concomitantly a contractile reaction which appeared to act somewhat like a unifying agent.[10] Neuburger took interest in Swedenborg's writings, his at times incisive judgments, and his compendium of the best information available on the brain and nerves in the mid-18th century. This is indicated by Neuburger's papers on Swedenborg (footnote, p. 221) and by his addresses presented before the Centenary Congress of the International Swedenborg Society in 1910.[11] However,in the mid-18th century, the experiments of the Bartholin, Haller, and particularly Lorry convincingly demonstrated that dural movements are entirely passive and are secondary to vascular and respiratory movements transmitted through the brain (pp. 90–91).

Galen regarded the spinal cord as a conductor of animal spirits from the brain to the nerves that supply the body; he had demonstrated that transection of the cord abolished motor control below the level of the

9. L. Kruger, "Biographical Note on François Pourfour du Petit" *Experimental Neurology* 7 (1963): iii–v; S. Duckett "Étude de la fonction cérébelleuse par François Pourfour du Petit," *Encephale*, 53 (1964): 291–98.

10. E. Swedenborg, *The Brain,* trans. R. Tafel, 4 vol. (London: Speirs, 1882), pp. 152–53 and 259.

11. *Transactions of the International Swedenborg Congress, London July 4 to 8, 1910*, 3rd ed. (London: The Swedenborg Society, 1912).

incision. Further advances in spinal neurophysiology in the 18th century were complicated by the views taken concerning the operation of the soul, of the site of consciousness, and the will. The apparently purposive behavior seen after transection of the spinal cord seemed to require the presense of a degree of consciousness in the distal portion. Stahl's animism could account for this by the assumption that the soul is diffused throughout the body. Whytt attributed the apparently purposive behavior of the isolated spinal cord to a limited soul present in it, the "sentient principle." Whytt's view of the soul remaining in the cord was not, however, the same as the animism propounded by Stahl, as Haller and others thought at the time.[12] For Whytt the sentient principle acted as a necessary agent connecting body and soul, a "sympathy," with many of the properties that we would characterize as reflex. Whytt's position was a quasi-mechanism, derived both from animism and mechanism and was important in the development of our present concept of the reflex.[13]

In his opposition to Whytt, Haller considered only an inherent (immanent) property of irritability (contractility) or sensibility (the exclusive property of nerve) to be present in the organs of the body, there being no need for a rational soul to be present in the spinal cord. Unzer also considered the purposeful behavior of the isolated spinal cord to arise from nothing more than mere action and "sensibility," a nerve force (p. 162).

The concept of reflexes also had to take into account involuntary vital (autonomic) actions in the body. With respect to the question of an animistic agent in the spinal cord accounting for the vital control seen in the anencephalic or spinal animal, Bohn in the late 17th century asked rhetorically, "if beasts like men, can produce chyle, secrete bile, impose local movements on the blood, and create nervous fluid by the stomach, liver, heart, brain (respectively,) and without the influence or aid of a spirit-agent, why should we deny these powers to the vital organs of man without the cooperation of a rational soul?" (note 5, pp. 238–39).

However, it was felt that something like the *sensorium commune* was needed to account for the coordinated actions seen in reflexes. In the

12. R. K. French, *Robert Whytte, The Soul, and Medicine* (London: Wellcome Institute of the History of Medicine, 1969).

13. Ibid., p. 91.

18th century the ganglia were considered to play some such role. In Unzer's view, the ganglia directed those nerve energies that are not under immediate control of the soul, i.e. they controlled the autonomic actions that are independent of consciousness and will. His view and that of Prochaska contrasted with the views of those who considered the ganglia to have conscious direction over the movement of animal spirits, e.g. Willis, Vieussens, and Lancisi (p. 164). Winslow thought of ganglia as little brains possessing muscle fibers able to accelerate the (nerve) fluid in their fibers. A decrease of nerve fluid flow by an action of the will was proposed by Le Cat and by Johnstone.

Hall in 1837 took the position that the reflex is a mechanical operation of the spinal cord, and is explicable in principle by its neuronal connections. The philosophical differences between vitalists and mechanists remained, however, although in somewhat altered form. Early in the 19th century Legallois attributed the purposive reflex activity seen after lesion or section of the spinal cord to the creation of a center of volition and consciousness when the spinal cord is isolated by section. A somewhat similar view had been propounded by Porterfield and other Stahlians, who considered "that even vital movements were once voluntary, and wise, and only by 'use of custom' became involuntary."[14] This problem was again taken up in the famous Pflüger-Lotze controversy of the late 19th century.[15] Pflüger took the vitalist view that the soul could be divided; the portion that remained in the isolated spinal cord accounting for purposive actions. Lotze held that the soul does not produce reflex actions directly but that reflex movements result from previous performances carried out when the brain and consciousness were present, and when experiences were gained and such movements had been practiced. These arguments are difficult to assail directly, but some of the positions have fallen by the wayside. Sherrington proposed that reflexes are mechanical but that they could represent evolutionary acquisition of successful behavior, which in earlier forms had been attended with consciousness.[16] There is also the modern realization that mechanisms can be constructed which behave in an apparently purposive (goal-seeking) manner.[17]

14. Ibid., p. 92.

15. F. Fearing, *Reflex Action* (Baltimore: Williams and Wilkins, 1930), p. 164.

16. C. Sherrington, *Integrative Action of the Nervous System* (1906; reprint ed. Cambridge: Cambridge University Press, 1947), pp. 236–38.

17. N. Wiener, *Cybernetics,* 2nd ed. (New York: John Wiley & Sons, 1961).

In the seventeenth century the concept of nerve spirits or a nerve fluid responsible for nerve action was replaced by the belief that a variety of different physical or chemical agents were responsible for nerve action. Arnemann, for example, considered the nerves to be elastic and contractile, impulses being transmitted in them by a kind of "vibration and oscillation." Neuburger does not discuss at great length the various agents other than electricity that were proposed to account for nerve action. The early electrical studies made on the sciatic nerves of frogs stimulated by electrical spark discharges from Leyden jars readily suggested that the nerve fluid itself was electrical (p. 193). Galvani viewed the brain as generating "animal electricity," which flowed down the nerve as the agent of its action; thus he assimilated animal electricity to the old concept of animal spirits.[18] This hypothesis appeared to receive strength from studies on the torpedo fish. When this animal is decapitated, the electrical shocks delivered from its electric organs soon cease (p. 196). Galvani's views were pursued enthusiastically by Aldini (p. 198), who used electric piles to stimulate the heads of freshly decapitated animals—including those of human beings freshly guillotined—in order to elicit movements from them. Eventually this line of crude investigation led to more precise electrical stimulation of exposed brains of animals by Fritsch and Hitzig, who first convincingly demonstrated the motor areas by this means in the latter part of the 19th century.

The dependence of vital functions on the brain was derived from the opinion that the soul is a life-giving agent. Such dependence appeared to be the case with respect to respiration but not with respect to cardiac activity, digestion, secretion of urine or production of heat (chap. 13–15). Bichat's experiments showed that when the brain was damaged and the animal died, the heart continued to beat for a time, indicating its relative independence of the brain. Respiration, on the other hand, stopped quickly thereafter, indicating the direct control of the brain over respiration.

Cruikshank demonstrated spinal control over respiration by transecting the cord between the cervical and thoracic levels and finding

18. L. Galvani, *De viribus electricitatis in motu musculari* (1791; reprint ed., *Commentary on the Effects of Electricity on Muscular Motion With Notes and Critical Introduction by I. B. Cohen*, trans. M. G. Foley, Norwalk: Burndy Library, 1954); Sidney Ochs, "The Early History of Material Transport in Nerve" *The Physiologist* 22 (1979): 16–19.

an immediate arrest of respiration, similar to that seen on cutting the phrenic nerves. His experiments were followed by those of Legallois, who located the vital control over respiration in a part of the medulla oblongata. Charles Bell identified a region in the lateral part of the medulla oblongata which was important in "uniting the various respiratory muscles in harmonious action" (p. 207), a region which could also be controlled by voluntary impulses.

The studies carried out by Philip in 1818 showed that the brain could regulate the cardiovascular system partly, as was indicated by changes in the heart rate seen after trauma of the brain or the application of various poisons to it. Clift and Treviranus at that time found a region in the cervical cord that could influence heart rate, further demonstrating the influence of the nervous system over the cardiovascular system.

A relation between the nervous system and digestion had been indicated by studies of Willis. When the vagi of dogs or other animals were cut, retching, vomiting, and difficulty in swallowing occurred; if the animal survived those immediate difficulties it later died of inanition. Effects of vagal section on the digestive system were also seen by Baglivi, Haller, Legallois, Milne Edwards, and others.

The cause of death remains unclear and it appears from similar experiments carried out recently, that factors other than starvation are required to account for the lethality of vagotomy.[19]

Better understanding of the nervous system required improved experimental observations, not philosophical arguments. The key to such understanding was the recognition of sensory and motor roots in the spinal cord, the Bell-Magendie law. While the existence of separate sensory and motor nerves was inferred by Erasistratus (note 80, p. 88) and Galen (note 2, p. 247), by Haller's time opinion shifted to the view that both motor and sensory functions could be carried out by the same nerve fibers. Even though the presence of ganglia only on the dorsal roots had attracted the attention of such astute investigators as Soemmering and Prochaska (p. 39), they failed to grasp its significance. Walker in 1809 clearly conceived of the roots as sensory and motor, but thought perversely that the anterior roots carry sensory impulses and the dorsal roots carry motor impulses.[20]

19. Sidney Ochs, "The Early History of Nerve Regeneration Beginning with Cruikshank's Observations in 1776," *Medical History* 21 (1977): 261–74.

20. [A. Walker], *Documents and Dates of Modern Discoveries in the Nervous System* (1839; reprint ed. with an introduction by Paul F. Cranefield, Metuchen: Scarecrow, 1973).

It was left for Bell and Magendie to establish the separation of function in the roots. This is designated by Neuburger in Chapter 17 as Bell's discovery. Few such fundamental discoveries in science led to as violent and protracted a struggle for recognition of priority. Neuburger's evaluation of the contributions of Bell and Magendie came at the turn of the century, before all the evidence was in.[21] Bell's studies were published in 1811 in a privately distributed paper, wherein he described muscle convulsions on transection of the anterior roots and no effect on transection of the dorsal roots. Bell did not express himself clearly with regard to the posterior roots and the dorsal columns. According to Neuburger, "he dared not make any comment about the degree of sensitivity of the posterior columns because of the pain caused by the operation itself" (p. 255). Here we tread on one of the main issues of the priority struggle carried out on Bell's behalf by his brothers-in-law John and Alexander Shaw. It was just this that Magendie claimed to have discovered in 1822; namely, that stimulation of the posterior roots gave evidence of painful sensation, while stimulation of the anterior roots gave rise to motor responses without evidence of sensory stimulation. Neuburger did not reference Magendie's key papers of 1822.[22] This is a point of significance in that Bell republished his 1811 paper in 1824 taking Magendie's findings into account without giving him credit.

In his final chapter Neuburger takes up the early 19th-century experimental studies of the cerebellum and cerebrum. By this time it had been recognized that the vital processes are the province of the medulla oblongata and are not referable to the cerebrum or the cerebellum. Speculation on cerebellar function became fanciful. It was considered, for example, to be the organ of will or instinct (Walker), a motor or "battery" (Reil), an organ analogous to the electric organs of fishes (Rolando), an auditory ganglion (Schoenlein), a general ganglion (Carus), an organ exciting life processes in autonomic organs (Ackermann), and doing this from within the ventricle (Dollinger), the central organ of general sensations (Reil), or the seat of sexual feelings (Gall). Despite technical flaws in his studies, Rolando in 1824 observed disturbances of coordinated movement to follow upon cerebellar lesions; and with the

21. P. F. Cranefield, *The Way In and the Way Out* (Mt. Kisco: Futura Publishing Co., 1974)

22. F. Magendie, "Experiences sur les fonctions des racines des nerfs rachidiens," *Journal of Physiological and Experimental Pathology* 2 (1822): 276–79; idem, "Expériences sur les fonctions des racines des nerfs qui naissent de la moelle epinière" *Journal of Physiological and Experimental Pathology* 2 (1822): 336–71.

work of Flourens the role of the cerebellum as the organ responsible for equilibrium, posture, and coordination during volitional movements gained recognition.

Rolando had noted deep stupor to follow the creation of cerebral lesions. The study of mental faculties in the cerebrum was open to experimental attack. In this Gall played a significant role, which extended from the beginning of the 19th century almost to its end. He had surmised that the higher functions were localized in the cortex and, with his colleague Spurzheim, proceeded to make inferences and deductions which led from cranial shapes and cranial protuberances to the underlying brain and mental faculties for which these were supposedly responsible. This flowered into the pseudoscience of phrenology. Neuburger's admiration of Gall went to an extreme. He wrote, "Gall was the first to claim that mental activities were localized in the cortex alone; the white matter he relegated to the role of a system of conduction and projection. If this view, which is in such complete agreement with modern science, is compared even momentarily with that of Haller or even with that of Soemmering, how striking is the contrast between Gall's achievement and theirs! With rare perspicacity, Gall was able to rise above the milieu of his time and go his own way, quitting the well-trodden pathways of his predecessors. He has been frequently criticized for localizing complex psychical activities in separate 'organs' of the cortex, but has not 'one' recently returned to this view to some degree?" (p. 268).

In the twentieth century Gall has received attention from a number of highly esteemed historians of medical science as one who helped to promote the study of cerebral function.[23] However, the assignment of mental faculties by Gall and Spurzheim to various parts of the cortex on the basis of a shaky introspective facultative psychology clashes with Neuburger's stated admiration for experimental evidence. Neuburger had emphasized that it was through direct experimental studies that better understanding of the brain was gained and that the realm of philosophy, including speculation regarding faculties of the soul and introspective theorizing, becomes reduced. As Neuburger stresses in his summary, the concept of functional localization acted as the chief

23. E. H. Ackerknecht and H. V. Vallois, *Franz Joseph Gall, Inventor of Phrenology and His Collection* (Madison: Department of the History of Medicine, University of Wisconsin Medical School, 1956).

guiding concept in the discovery of cerebral function. Perhaps from that point of view it was this impetus which Gall gave that made him seem so important to Neuburger, especially in contrast to Flourens, who viewed the cortex as completely undifferentiated with respect to localization of function.

History has been kind to Neuburger's book. His judgments are predominantly sound but not completely free from idiosyncracy, e.g. his view of Bell's priority in the Bell-Magendie controversy and his overvaluation of Gall's contribution. Neuburger's enthusiasm for experimental science was more than justified. The pioneering studies that he described have provided the basis of our present knowledge of cerebral function. New techniques have allowed increasingly selective ablations to be carried out on ever more precisely defined anatomical structures, down to the level of the individual neuron, which can be studied with markers carried by axoplasmic transport. The relatively crude cortical stimulation described by Neuburger led, with refinements, to the later discoveries of Fritz and Hitzig and then to the more recent studies of single neurons revealing a complex pattern of neuronal organization in the cortex. We can see the continuum of effort from the gropings of the past as described by Neuburger to the richness of our understanding of the nervous system today. It is to be hoped that the studies of the late 19th and 20th centuries will be as well treated by a future historian, one as gifted to serve our age as was Neuburger for the period that he described.

Throughout this book the sure hand of Dr. Clarke has been apparent. The German translation is accurate in transmitting the original meaning in a felicitous manner, free from stilted Teutonisms. The bibliographic corrections and additions are thorough and should be of value to the student and working medical historian.

As translator and annotator, Dr. Clarke was ideally suited for this task, one which apparently took at least ten years.[24] His mastery is evident in the earlier translations (made in collaboration with O'Malley) of classical studies of the nervous system,[25] his book with Dewhurst picturing the development of our conception of the brain,[26] and in his

24. Clark and Dewhurst, *An Illustrated History of Brain Functions*, note on Neuburger.

25. E. Clark and C. D. O'Malley, *The Human Brain and Spinal Cord* (Berkeley: University of California Press, 1968).

26. Clark and Dewhurst, *An Illustrated History of Brain Functions*.

various papers. There is also his association with the Wellcome Institute as director of its library of medical history. Neuburger had a special relation to the Wellcome Institute. After having to flee Nazi persecution in Germany in 1939, he was given a place at the Wellcome Historical Medical Museum, where he stayed for almost ten years, working on the Museum's collection of manuscripts and on his own historical researches. As stated by the late F. N. L. Poynter, a former director, "the museum and its library benefited from the old master, and perhaps its present shape and prestige derive from him" (p. xiii), a compliment both to Neuburger and to the Wellcome Institution, which has done so much to foster appreciation of medical history.[27]

The publishers are to be commended for bringing out a work of this stature at reasonable cost—no small achievement nowadays. This book can serve as a model to translators who undertake the often laborious task of keeping alive the classics which are basic to our concept of the history of medical science.

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27. C. Gray, "The Wellcome Library: Reflection of an insatiable collector," *Canadian Medical Journal* 26 (1982): 712–21.

The Calamities of Surgery

LAST Friday a patient died under the influence of chloroform. It was given with all customary care, and there is nothing in all the circumstances to which we can refer that would imply that anything was left undone that ought to have been done, or anything done that should not have been done. In the morning I had advised the chloroform for this patient, whose hand had to be put straight in order to avert the deformity that was being occasioned by disease of the wrist-joint. In the afternoon my house surgeon and a dresser were giving it, the pulse suddenly failed, and the patient sank and died. The friends would not allow a post-mortem examination, so the case affords us no useful information. But the fact that I want you to keep in mind is that notwithstanding all care, and all good intention, surgery shortened to a few minutes this woman's life that might have lasted many years. At the very worst she would have gone about for the remainder of her life to a good old age. She died; and died without any warning of her danger.

This is one of the calamities of surgery. It is one of the many cases that lead one to the wish that something might be discovered or invented which should combine what, I believe, was the greater safety of sulphuric ether, the first and original anesthetic, with what is the far greater convenience and facility of administration of chloroform. But till that substance is discovered we shall have to proceed in surgery with uncertainty; or rather with the certainty, that occasionally, we cannot tell when, some one whose life we are trying to prolong or ease will die, and die by the means that we use to save him from pain.

Sir James Paget, *Clinical Lectures and Essays*
(London: Longmans, Green, 1875), pp. 51–52.

ESSAY-REVIEW

FULLER, ROBERT C. *Mesmerism and the American Cure of Souls.* Philadelphia, University of Pennsylvania Press, 1982. 248 pages. Price $20.00.

Reviewed by ERIC T. CARLSON

RELIGION and science, especially in the form of medicine, have always shared a common concern about certain aspects of human behavior, such as the normal, the troublesome, the maladaptive, and the symptomatic. This shared concern has not always been harmonious; it was often filled with competition and even bitterness when the boundaries of responsibility and advantage became unclear. This can be observed today in the field of mental health, to which workers come after varied training and approaches, especially toward therapy and psychotherapy. In this setting some ministers are being paid by insurance programs for doing psychotherapy and they face the need for malpractice insurance, which has already been offered to them. A similar fluctuation of boundaries could be seen at the end of the nineteenth century, when the American mind-cure movement appeared to be closer to religion than to medicine.[1] Another root of this movement, also shared by medicine, was the use of mesmerism. Mesmerism brings together in a unique fashion a number of themes that have a long history in therapy: the role of the trance, the changing conception of the role of the spirits, and action at a distance.

In many preliterate societies there was a person called the shaman or medicine man to whom the role of healer was assigned. In many ways the shaman can be seen as the prototype of the modern psychotherapist. Society gave him (or her, as many cultures have assigned this role to women) the responsibility of overcoming the causes of the various

1. The interested reader should also turn to Charles S. Braden, *Spirits in Rebellion: The Rise and Development of New Thought,* (Dallas: Southern Methodist University Press, 1963), which is the best narrative history of the subject. It should be supplemented by Gail Thain Parker, *Mind Cure in New England: From the Civil War to World War I* (Hanover, N.H.: University Press of New England, 1973). Background for understanding the American medical psychotherapy of the same period is provided by George E. Gifford, Jr., editor, *Psychoanalysis, Psychotherapy and the New England Medical Scene, 1894–1944* (New York: Science History Publications, 1978).

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illnesses that afflicted members of the tribe. Some afflictions were simple cuts and bruises and received predominantly naturalistic treatments. Some were more obscure and required greater diagnostic work by the medicine man. This procedure was usually accompanied by a public performance filled with drama and rhythmic beating of rattles and drums. Often the medicine man would heighten his diagnostic and therapeutic abilities by smoking or ingesting some mind-altering natural product. Through this ritual he would enter a state of altered consciousness or trance in which his capability to provide an explanation of what was wrong was enhanced. This state was greatly influenced by the types of explanation found acceptable by the tribe. Although they varied from tribe to tribe and region to region, they showed remarkable consistency.[2]

Space allows only a list of the acknowledged causes: intrusions—both of material and foreign bodies and spirits—breach of taboo, soul loss, and sorcery or magic (including both imitative and contagious magic). Under spirit intrusion we find the subcategory of possession. In the concepts of preliterate man the world seemed as one; his explanations incorporated the naturalistic, the magical, and the religious into a unified whole. The medicine man's responsibility was to make contact with the divine other world of spirits, to find out what was wrong, and to take appropriate measures to remove their distress. Why this constellation is so consistent is both complex and unclear; in part it has to do with the character of the human mind and in part with perceptions of and puzzlements about the outer world. The capacity to dream must have played an important role. Man found that in dreams he could do impossible things: for example, he could fly, travel instantly to distant places, and see people who had died long ago. This kind of mental journey seemed as real as life and suggested to the early theorist that something must have traveled and then returned, and that there must be some vehicle that made the transportation possible. The most obvious model in nature, commonly used, was that of the air and its phenomena.

Air presented early man with a puzzling problem. Careful observation and thought suggested that the skies were filled with something which could not be touched, seen, or tasted. Yet birds flew through it, and

2. Erwin H. Ackerknecht, " 'Mesmerism' in primitive societies," *Ciba Symposia* 9 (1948): 826–31; William Sargant, *The Mind Possessed: A Physiology of Possession, Mysticism and Faith Healing* (Philadelphia: Lippincott, 1974).

under certain circumstances it would hit one's face and whistle through the trees during storms. Eventually man learned to harness the moving air or wind in order to propel his boats. Gradually he learned about its role in sustaining our fires and our animal heat. In the western world the ancient Greeks recognized that the human body maintained an intimate relationship with the void of the world, which we rhythmically drew in and expelled from our bodies in respiration. This something, or world spirit, was postulated by the Greeks as being a pneuma, and essential for bodily life. Once we stopped breathing, we were dead and grew cold. It was as if our pneuma had departed and returned to the spirits of the world. But our personal spirits (which come from the Latin word for pneuma) had not departed forever, since they could visit friends in dreams and in states wherein there were visions.

The Greeks introduced the pneuma into the naturalistic functions of the body. The ancients took the concepts further and, when they gradually postulated a system of three spirits in the body, left us with a legacy that lasted nearly two thousand years. The natural spirits were related to nutrition and the liver and flowed to the heart, where they were converted into vital spirits. These spirits made their way through the body by way of the vascular system, but those that reached the brain were converted to the rarest and finest of all, the animal spirits. These were the spirits that created the highest functions of motion, perception, and the most miraculous one of all—thought. Although this tripartite system lasted over the centuries, the concept underwent gradual and intermittent changes. The pace accelerated during the major scientific advances of the 17th century. By the early part of the next century, animal spirits had been redefined as nervous fluid coursing through hollow nerves and subject to the laws of hydromechanics. Nevertheless, when it came to the mind itself, most medical writers still conceptualized the mind as immaterial and therefore still closer to the spirit world than the material, despite its effects on the body.

The idol of the 18th century scientific world was Isaac Newton, a devoutly religious man, who struggled to understand light, gravity, and therefore the action of force at a distance. One of his friends was the eminent British physician, Richard Mead, who wrote of the human body as if it were a hydromechanical machine and thereby subject to gravitational force acting on its fluids, just as tides respond to the phases of the moon. A young medical student, Franz Anton Mesmer, in writing

his doctoral dissertation in 1766 and largely borrowing from Richard Mead, developed a concept of animal gravitation to explain human biological function.

Mesmer, after receiving a Jesuit education, had shifted his interests to law and philosophy and then to medicine. In similar fashion, his theoretical and therapeutic interests also shifted when he proposed an animal magnetism in human biology. It was partly due to his discovery that he could bring about changes in people at a distance, even by pointing at a person's reflection in a mirror. What kind of magic was this? Science offered some hope of an answer. Even Newton had proposed the concept of an ether in space to help explain numerous phenomena, including action at a distance. Mid-century physiologists, becoming quite certain that the nerves are not hollow, proposed an extra fine, almost immaterial fluid called the nervous ether, in order to elucidate nervous function. The period that followed 1745 was also a time of enthusiasm and experimentation with electricity; it was inevitable that writers would start to speculate that nervous transmission was really electrical. Magnetists also entered the debate and some writers speculated that the nervous ether was made up of a series of particles arrayed like diminutive magnets. This was the setting in which Mesmer was influenced by Maximilian Hell, a Jesuit physicist. Mesmer started to use magnets in treatment. At about the same time he introduced his therapeutics into areas where the famed Father Johann Joseph Gassner had recently brought about miraculous cures. Mesmer soon thereafter participated in an investigation of Gassner's results and showed that by means of animal magnetism he could duplicate many of the effects of Gassner's exorcisms. As he spoke of natural causes and preternatural ones, Gassner well illustrated the long tradition still continuing from preliterate societies. He divided preternatural causes into three types: natural-appearing illnesses caused by the devil, sorcery, and possession.

At first glance it may appear that philosophical explanations had not changed much, but this is not correct. Medicine and science were making intermittent progress in defining the naturalisitic causes of a variety of illnesses; this trend would accelerate in the 19th century with the growth of physiology, histology, and bacteriology. The 19th century provided the essential climate for the development of the social sciences—anthropology, sociology, and finally psychology—as man himself became more and more an object of scienific concern. This growing scientific emphasis could be seen in the deliberations and

experiments of the French Royal Commission of 1784, which investigated Mesmer's therapy; Benjamin Franklin, the American pioneer in electrical research, acted as at least titular chairman. The deliberations proved quite effectively that there was no evidence of any type of magnetic fluid emanating from the biology of man. Instead, they moved towards psychology by implicating the role of imagination in the phenomena produced. But at this early date the scientifically minded usually were not much interested in psychology, while attention to mesmerism was kept alive for other reasons by popular and peripheral medical groups.

One of the fascinating aspects of the history of hypnotism, still inadequately investigated, has been the ebb and flow of excitement for and the attention paid to this procedure during almost the last two hundred years. Attention varied in time from country to country, although some countries seemed to travel almost in parallel.[3] The initial enthusiasm appeared in France, where the flame seems to have burned brightly for nearly a century in spite of the negative Royal Commission report of 1784. Whatever the reduction that occurred, a revival in the 1810s led eventually to another investigation, which in 1831 issued a much more favorable report. German interest in the early 19th century appeared to parallel that of France, probably influenced by interest in romanticism.

This was not true in Great Britain. The original Franklin report had been translated into English in 1784 and there was a brief flurry of publications in the 1790s, but otherwise the British scene apparently was as quiet as the American. Only perkinism seemed to arouse some comparison to mesmerism in the new country.[4] There was a slight spurt under French influence in both England and the United States in 1829, but the significant inspirations (the word means the taking in of spirits) followed French visits to each country in 1836–37. In 1837 the visiting Baron Dupotet du Sennevoy excited John Elliotson's imagination in London and this ultimately ruined Elliotson's sterling medical academic career.

In the previous year a partly trained medical practitioner from France arrived in New England via the West Indies and started to

3. Jacques M. Quen, "Case studies in nineteenth century scientific rejection: Mesmerism, Perkinism, and acupuncture," *Journal of the History of Behavioral Science* 11 (1975): 149–56.
4. Jacques M. Quen, "Elisha Perkins: physician, nostrum-vendor, or charlatan?," *Bulletin of the History of Medicine* 37 (1963): 159–66.

proselytize for animal magnetism. After a two-year flurry of activity, Charles Poyen succeeded in interesting the Americans in mesmerism.[5] In his interpretive account Robert C. Fuller attributes this eager acceptance of animal magnetism in part to the religious revivalism of the time; one factor that would arise from this movement was the increasing acquaintance with the trance states that sometimes occurred during their stimulating religious services. In addition, Poyen's efforts attached mesmerism "to the Jacksonian era's belief in the ultimate perfectibility of society through the progressive improvement of its individual citizen" (p. 21).[6] Poyen's departure from the United States in about 1839 led to an apparent hiatus of enthusiasm for the next two years. Then in the 1840s a sudden plethora of popular publications appeared. Fuller briefly traces these and their influence on the new thought or mind-cure movement at the end of the century. In the process he makes a contribution to the understanding of the role of mesmerism in American culture and religion, but not in medicine.[7]

5. Eric T. Carlson, "Charles Poyen brings Mesmerism to America," *Journal of the History of Medicine* 15 (1960): 121–32.

6. All page numbers in parentheses refer to Fuller's book.

7. One of the major lacks of Fuller's book is his neglect, which must have been purposeful, of the medical literature on mesmerism and psychotherapy. It is true that he uses Henri Ellenberger's excellent book on the impact of hypnotism and the concept of the unconscious on the development of psychoanalytic therapy. The interested reader would probably do best by starting with a recent book by E. M. Thornton entitled *Hypnotism, Hysteria and Epilepsy: An Historical Synthesis* (London: Heinemann, 1976). This slim volume (205 pp.) gives a quick survey of a period lasting a little more than a century, from Mesmer to the times of Hippolyte Bernheim, and sweeping through French, British, and German history. At the same time, one must be aware that this author has a very special hypothesis to present; that is, that the phenomena of hypnosis are related to various discharge effects seen in epilepsy and temporal lobe epilepsy. This is a thesis that should spark considerable controversy. Further information on dissociation states and religiosity in relation to temporal lobe epilepsy is provided by Laura Schenk and David Bear, "Multiple personality and related dissociation phenomena in patients with temporal lobe epilepsy, "*American Journal of Psychiatry* 138 (1981): 1311–15. Ellenberger's volume is encyclopedic and its thorough index gives the reader easy access to topics that are of interest. It may be supplemented by Leon Chertok and Raymond de Saussure's small volume entitled *The Therapeutic Revolution: From Mesmer to Freud* (New York: Brunner/Mazel, 1979). Half of this study is on the history of hypnotism in France and the other half is on Freud. Another book that is valuable in understanding the preFreudian era at the end of the century is the study by A. R. G. Owen entitled *Hysteria, Hypnosis and Healing: The Work of J. M. Charcot* (London: Dennis Dobson, 1971). Charcot was in the center of the redefinition of what were previously religious matters into the field of medicine, with particular reference to witchcraft and hysteria, as has been shown clearly in a recent article by Jan Goldstein, "The hysteria diagnosis and the politics of anti-clericalism in late nineteenth-century France," *Journal of Modern History* 54 (1982): 209–39.

Fuller's treatment of psychology and mesmerism is an unusual example of scholarship. He says, "the story of mesmerism is thus very much the story of why Americans first turned to psychological ideas in their individual quests for wholeness." Mesmerism, "the nation's first psychological system. . . now looms as a much larger determinant of the nineteenth-century legacy to modern self-understanding than we had formerly observed." It "developed into a full-blown philosophy of human nature" (pp. x–xi). Approaching the subject from a religious point of view, Fuller writes, "both in its doctrines (belief) and therapeutic practices (ritual), mesmerism framed symbolic processes through which individuals might learn to participate in some ultimate reality." Therefore "a historical analysis of mesmerism would appear to mount an impressive argument that the early development of social and scientific thinking in this country registered, not so much the abandonment of religious interest, but rather its divorce from apparently outmoded ecclesiastical and scriptural forms." The psychology of mesmerism provided a partial means toward "self-discovery" and the

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Illustrating the widespread interdisciplinary interest in hypnotism is the fact that some of the best accounts about mesmerism in Great Britain appear in studies from a literary scholar writing on the history of literature. Fred Kaplan's book *Dickens and Mesmerism* (Princeton: Princeton University Press, 1975) presents an excellent picture of the rise of interest in mesmerism in the late 1830s and its extension into the early 1850s. The major early figure in this enthusiasm was a previous well-respected London physician, John Elliotson, who lost his university appointment and much of his reputation through his efforts to advance the cause of mesmerism. He founded a main journal of hypnotism, *The Zoist,* which had a relatively long life compared to the other journals of similar nature (1843 – 1856). Further information about Elliotson may be obtained from another publication of Kaplan's entitled *John Elliotson on Mesmerism* (New York: Da Capo, 1982), which consists of an introduction and reprints of various portions of Elliotson's published writings on the subject.

It is interesting that the best available unpublished study of mesmerism in America is also the product of a historian of literature. William D. Baker, Jr. wrote his doctoral dissertation at Northwestern University in 1950, entitled "The Influence of Mesmerism in Nineteenth Century American Literature." Anyone contemplating research in this field should obtain a copy. The best published survey of the American scene is the one by Allan Angoff in the fourth volume of *Abnormal Hypnotic Phenomena: A Survey of Nineteenth-Century Cases* (New York: Barnes & Noble, 1968), edited by Eric J. Dingwall. In the same volume is Dingwall's study of hypnotism in Great Britain. This set covers the French history in the first volume and ten other countries or areas in the next two. It is indispensable, even though its focus is theoretically limited to issues that deal with parapsychology or the paranormal. With all the attention by Fuller to the role of spiritualism, Dingwall's efforts become particularly useful as an adjunct to the understanding of how mesmerism played a role.

exploration of "their own psychological depths" plus formulas for "psychological self-adjustment." But "the Americanization of animal magnetism finally drove psychology clear out of its mind" (pp. 103–4). What were the nature and content of this psychology beyond that stated above? He does not really tell us.

That mesmerism dealt with matters of psychology is unquestioned. As a procedure it changes the behavior of the subject, creates different states of consciousness, and does strange things to memory. Perceptual and thinking processes are either repressed or augmented, even apparently to the point of prophecy, clairvoyance, and ultimately to apparent contacts with the spirit world. It depends on definition, of course, but animal magnetism is not usually viewed as a psychology. It is hardly the nation's first psychology. One need only turn to the writings of Cotton Mather and especially Jonathan Edwards for psychologies that arise from a religious setting. In addition there were the influences of John Locke, of the Scottish school of faculty psychology which had such large impact on the American intellectual scene, and the various strands of French and German thought that were penetrating American philosophy early in the 19th century. Neither is it accurate to call mesmerism the first *popular* psychology in the United States; there had been great enthusiasm for phrenology before animal magnetism had any significant influence in the United States. Even though phrenology was combined with mesmerism in the early 1840s as phrenomagnetism or phreno-mesmerism, it was less useful to religious thought. Being much more attached to a neurophysiological base in spite of its widespread popular acceptance, phrenology not only did not give any room for roaming spirits, but it was frequently attacked as being materialistic and therefore a threat to religion. Fuller defines mesmerism as a psychology and then takes no interest in exploring what were the ingredients of this psychology and what people did with them. From my point of view this is unfortunate.

There is also no question that mesmerism engaged what was usually considered to be the higher powers of the mind. There is something awe-inspiring about a person who is in a trance and who exhibits augmented powers bordering on the occult, as Jane C. Rider did in 1834. In her somnambulism in Springfield, Massachusetts she was able to see well in the dark and, as a result, became a figure well known in the United States and Great Britain. In 1837, one of John Elliotson's two O'Key sisters developed a medium while in a mesmeric trance. This

communication at a distance brings us back to the Greek pneuma, but now the emphasis was on an energetic and magnetic fluid which not only acted between two human beings but also made contact with the spirit world possible. Spiritualism would begin a prolonged period of enthusiasm in the late 1840s, starting in upper New York State and spreading to Europe. Then other activities moved in, including the optimistic scientific investigation of parapsychology. Fuller restricts himself to the concept of mesmerism, which he defines as limited to the historical phase of hypnotism where the accepted theory was that of a magnetic fluid that could be transmitted or at least concentrated by attention and will power between two people. This hypothesis faded gradually as new attempts were made to understand the phenomena. In 1838, when people like Thomas Wakley disproved John Elliotson's belief in animal magnetism, he not only repeated experiments similar to those done by the Franklin Commission some fifty years earlier, but he reemphasized that imagination, compliance, and perhaps collusion were the explanatory models. There he dropped the matter, for he was not interested in advancing the doctrine, but it was not long before his fellow countryman, Dr. James Braid, took up this direction and redefined the cause in terms of focusing of attention, and brain physiology. In 1843, to fit this new explanation, he renamed the phenomena first neurypnology, then hypnosis and hypnotism. This gradually allowed for academic investigations, but not without much opposition. Returning to Fuller's animal magnetism, it appears to have the broader implication of possible spiritual contact, although, to the best of my knowledge, no one claimed to have made contact with God directly. Usually it was the souls of the departed who communicated with brothers still living on earth. But it took a special state, usually a trance, and a higher state of presumably normal faculties, to make this private dialogue possible. The phenomena of trance states gradually helped make it clear that a whole submerged part of man's psyche existed outside the sphere of consciousness; it had power and could affect conscious behavior. Fuller, following the superb book by Henri Ellenberger, points out well the role of mesmerism in the development of the idea of unconscious factors and the origin of modern psychodynamic psychiatry.[8]

8. Henri Ellenberger, *The Discovery of the Unconscious: The History and Evolution of Dynamic Psychiatry* (New York: Basic Books, 1970).

Much of Fuller's book deals with topics that could be investigated from other angles. Take, for example, the story of movements, enthusiasms, and fads. These could be approached internally. What, for example, is enthusiasm? Does it always relate to experiences that have religious factors? Or, to come at the subject from another direction, what is the human experience of enthusiasm? What is its range? Is a religious enthusiasm different from others and in what respect? Is a fad only an enthusiasm with a socially defined trivial object? How does ecstacy fit into this picture? Is it religious, trance-like, sexual, or all three and even more? Enthusiasms could also be approached sociologically by exploring their natural life history. Are there characteristics of a beginning, a middle period, and an ending? Fuller says that mesmerism had ended by the turn of the century. Had its use been changed and was the interest more in hypnotism and the exploration of factors that were more psychological? There is evidence that medical interest in hypnosis entered another period of increased activity.

Fuller's evocative book focuses on the relation of religion to mesmerism and raises many points that are in dire need of further research. I hope he will take his explorations further. As he admits, his work is "historical rather than constructive in nature" and it is somewhat unfair of me to carp about what he has not done (p. 185). As a practicing psychiatrist I am more interested in what one is trying to treat and in how one goes about doing it. Ultimately another question gains greater import: how does one act and what steps does one take to prevent the disturbances that we are trying to treat? The subject is complex, ranging from the minute questions that arise from molecular biochemistry, to intrapsychic factors, through the interpersonal communications of the dyad, and then on to groups of different sizes and finally to culture itself.

The recurrence of patterns, albeit changing in shape and color, is important here. What happens with hypnotism is a good example of this (as is history itself). Enthusiasms for it arise, great hopes follow, and then interest slides away. Each time something is learned, something is answered, and when the next wave of enthusiasm hits, new questions will be asked. One may hope that this will lead to progress of knowledge. The comments of historians can help us see when we are only repeating old patterns and can push us into asking new and more useful questions in order to provoke a change. This can be seen in psychiatry, for example, where there is a shift of balance from attention to the

biological factors in mental illness to periods when concentration on the psychological has ascendancy.[9] There are also themes in the mind-cure movement that have recurred in recent years. The mind-curists advocated, among other things, aggressiveness or assertiveness, going to the attic to yell—this is like some precursor of primal scream therapy—or, at the other end of the spectrum, passivity, letting go, or relaxation. Dr. Edmund Jacobson was writing on this subject as early as 1908 and as a young student was reflecting the influences of the time. His influential book of 1929 entitled *Progressive Relaxation* splits the periods, while his life, which ended in January 1983, spanned the eras of mind-cure and today's enthusiasm for behavior therapy, EST, group encounters, and scientology. Great opportunities exist for cultural and social historians to use themes such as these in their attempts to ascertain what were the broader forces that changed the emerging cultural pictures. There is also much room for an intellectual historian interested in the content of this history and practical effects that it may or may not have had. Mankind's unending quest for meaning, security, comfort, and even magic, still continues; variations on the patterns of man's attempts to provide answers will also continue. The mind-cure movement was a small but significant and still fascinating attempt to provide some answers.

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9. Norman Dain, "From Colonial America to Bicentennial America: Two centuries of vicissitudes in the institutional care of mental patients" *Bulletin of the New York Academy of Medicine* 52 (1976): 1179–96.

An Unusual Patient in the Westminster Infirmary

I also found in the male infirm ward an old French physician whom I had known by sight for a great many years when he was practicing his profession in Soho. He was a tall, fine man when I first knew him. He always used to wear a very singular-looking broad-brimmed hat. He was in all externals a very gentlemanly-looking person. I had missed him for a long time, and was surprised and hurt to think that he should have drifted to a workhouse infirmary. On inquiring into the cause of his becoming an inmate of the House, for I always thought he was well-to-do, as he dressed exceedingly well, I learned that he had lived with a lady who was an *employé* at a French milliner's in Regent Street, that she was much younger than he was, and that he had given to her all his money, which she, in preparation for possible consequences, had put in the Funds, but in her own name only. Unfortunately for him she was taken suddenly ill, and being ignorant of English courts made no disposition of the property, simply telling him, on her deathbed, where it was. When she was dead, he found to his dismay that the money could not be obtained, as he could not establish any legal claim of ownership. Grief at the loss of his mistress and of all his money caused the complete breakdown of the poor fellow, and he had come into the House utterly crushed. He was a very interesting old man, being the only son of a French noble family. His mother and father were both executed during the Reign of Terror, and when the family property was confiscated he was but a youth. When he grew up he studied medicine, and in the year 1802 entered Napoleon's army as a regimental surgeon. After serving with his regiment in Germany, Italy, and Austria, he was attached to the Army of England, as it was called, which was stationed on the heights of Boulogne. He was there some time. Suddenly an announcement came that the encampment would be broken up, and that the army would go to Russia. He traversed the whole of Europe, taking part in the various engagements on the road to Moscow, which he saw in flames. He was in the memorable retreat, and returned to France without a scratch. On the return from Elba he rejoined his old regiment, and as its surgeon, fought against the English at Waterloo. After the peace his regiment was disbanded, and as the old soldiers of the empire were very much at a discount he elected to come to England, where he lived since 1816. He died at the age of ninety-five, retaining his faculties to the last. After his death I raised a fund to bury him, by writing a letter to *The Times*, in which I gave his history, heading my letter, "A Relic of the Grand Armée," and asking any friends of the first Napoleon to help me in burying him in some other place than a pauper's grave. My appeal having brought me £25, the Empress Eugenie being one of the subscribers, he was buried at the Catholic Cemetery at Kensal Green.

Joseph Rogers, *Reminiscences of a Workhouse Medical Officer* (London: Unwin, 1889), pp. 132–34.

ESSAY-REVIEW

GILLIGAN, CAROL. *In A Different Voice: Psychological Theory and Women's Development*. Cambridge: Harvard University Press, 1982. 184 pages. Price $15.00.

Reviewed by ANITA G. SCHMUKLER

THE subject of women's morality has received much attention in recent times, particularly because early psychoanalysts echoed Freud in questioning the tenacity of the female superego. Current writers have spent much effort in attacking Freud's notion that the conscience of the woman is less substantive than that of the man, and frequently the assumption is that modern psychoanalysts uniformly accept that distortion.

Carol Gilligan, using both psychological research and literary references, writes a timely study of morality and consequent conflict in men and women. She states that her interest is in exploring varying levels of communication ("different voices") in our perceptions of our feelings and thoughts and of those communicated to us. Her interest is directed toward "the way people talk about their lives . . . the language they use . . ." and the ways in which people's associations reveal their perceptions and feelings. Much of the book is based on research material gleaned from interviews in which the associations of the subject were pursued. Thus, the responses appear relatively spontaneous. She investigates conflicts over moral questions, and the ways in which various people consider such issues. The age-range of the subjects is wide, the youngest being boys and girls in the time of their latency. The oldest were adults.

Responsibility, concern for others, and interest in maintaining relationships all emerge as highly significant for women who are making decisions of an ethical nature. One study focuses upon college students and their views of moral questions. A second studies women deciding about having an abortion. The feelings that they experienced after the abortion are included in the investigation. The "rights and responsibilities study," in which concepts of self are studied in conjunction with responses to moral dilemmas, involves both male and female subjects, aged six to sixty.

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After citing a number of studies related to conflicts over success in women, Dr. Gilligan asks that we consider "not why women have conflicts about competitive success but why men show such readiness to adopt and celebrate a rather narrow vision of success." The form of this question points to an essential weakness in the book. The depth would be increased if such a question were posed in the following way: "not (*only*) why (many) women have conflicts about competitive success, but (*also*) why (many) men show such readiness to adopt and celebrate a rather narrow vision of success." Dr. Gilligan's tendency to blot out particular aspects of a question occasionally produces a form of "tunnel vision" in an otherwise scholarly work. When two pre-adolescent children (a girl and a boy) were asked whether stealing a drug would be acceptable if it were required to save someone's life, the boy decided that theft would be appropriate and proceeded to justify his decision. The girl had more difficulty with the decision and tried to find an alternative solution to theft. From the responses of the children, the author tries to generalize about morality of girls and boys, i.e. the differing ways in which they face moral issues. While the imagery used by the children is fascinating and their intelligent approach is illuminating, we know very little about their life histories and events which significantly affected the formation of the conscience of each child. To the boy, "responsibility means *not doing* what he wants because he is thinking of others"; to the girl, "it means *doing* what others are counting on her to do regardless of what she herself wants." Further studies of adults lead the author to the conclusion that men fear entrapment while women fear isolation.

A chief difficulty in the book is that significant issues are dealt with as if they were determined entirely by conscious factors. Conflict of which the individual is unaware (unconscious) is excluded from consideration. Using the example of an eleven-year-old boy, Dr. Gilligan quotes the boy's response to the interviewer. "If you give an old lady your seat on the trolley, if you are in a trolley crash and that seat goes through the window, it might be that reason that the old lady dies," the boy stated. For Dr. Gilligan this illustrates "how actions undertaken with the best of intentions can eventuate in the most disastrous of consequences." For the scholar who is interested in unconscious conflict in human thought, the boy's comment might reflect rationalization for failing to give up his seat or it might be an expression of anger (wishing harm to

the woman) for having aroused conflict in him. Simultaneously the boy's response might reflect specific conflict related to his early life experiences.

Dr. Gilligan laments that women have been excluded from theory-building in psychoanalytic models. Roy Schafer reminded readers that Freud, in his hypothesis about male and female superegos, linked the female superego with that of the hysteric and the male with that of the obsessional. While the obsessional's superego is usually more rigid, it can in no sense be considered more "ethical."[1]

Dr. Gilligan refers pointedly to commonplace unconscious efforts to demean women, and she points out how these emerge with striking clarity in *The Elements of Style* by William Strunk and E. B. White. Examples in this classic demonstrate views which represent unconscious conflict toward women. "He was an interesting talker . . . had traveled all over the world" differs greatly from "Well, Susan, this is a fine mess you are in."[2] "It all goes back, of course," Dr. Gilligan comments, "to Adam and Eve," which tells us "that if you make a woman out of a man, you are bound to get into trouble." Yet such themes abound in world literature. Joseph Campbell, in *Primitive Mythology*, reports the Andamanese myth that initially there were only men in the world. Sir Monitor Lizard captured the man, took off his genitals, married him, and their progeny became the ancestors of the Andamanese.[3] In studying a multitude of such examples, in addition to fantasies of vagina dentata among primitive people as well as twentieth-century patients, one must raise the question of male envy of the female and its relation to efforts to demean women. In *Symbolic Wounds* Bruno Bettelheim studied the practice of subincision, practiced in primitive cultures, and related it to a wish in the male to emulate the female, particularly with respect to fantasies of power in the woman able to bear children. Subincision is also a way in which males in primitive cultures deal with anxiety over menstrual flow.[4]

1. Roy Schafer, "Problems in Freud's psychology of women," *Journal of the American Psychoanalytic Association* 22 (1974): 459–85.

2. William E. Strunk and E. B. White, *The Elements of Style* 3rd ed. (New York: Macmillan, 1979), pp. 3 and 7 (quoted by the author).

3. Joseph Campbell, *The Masks of God: Primitive Mythology* (New York: Viking, 1959).

4. Bruno Bettelheim, *Symbolic Wounds* (New York: Kollier, 1962).

Dr. Gilligan points to an important issue. "The danger men describe in their stories of intimacy is a danger of entrapment or betrayal, being caught in a smothering relationship or humiliated by rejection and deceit. In contrast, the danger women portray in their tales of achievement is a danger of isolation, a fear that in standing out or being set apart by success, they will be left alone." But what unconscious motives are likely to produce such a stance? A study of primitive peoples, myths, and conflict in modern society reveals significant fear in young boys of bodily damage. Frequently the damage is interpreted by the boy as punishment for wishes to be close to mother, while simultaneously banishing (or destroying) the father. For identification with the father to occur, the young boy's longing to be "like mother" must be repressed; that is, forgotten. But this means that his wish for the mother's magical power (to bear children) must be banished as well. The result is a persistent wish to prove prowess, partly in emulation of the father and partly in an effort to deny the humiliation that he cannot achieve the mother's magic. In a society that is not matriarchal, the girl must defend against magical powers attributed to her. To be liked and to feel accepted, she may adopt a position of weakness or ignorance. It is this defensive and weak position to which modern women address themselves and from which they wish to protect their daughters.

Dr. Gilligan examines "concepts of self and morality" from an entirely conscious perspective. Her conclusions are reached by what people *say* in response to questions. From a psychoanalytic viewpoint, however, our concepts of self are influenced developmentally by people who are significant in our early lives, as well as by conflicts related to various stages of our development. The sense of vulnerability which Dr. Gilligan observed in women engaged in moral decision-making may represent realistic vulnerability, fear of aggressive impulses, fear of retaliation, fear of being unable to fulfill what is expected, conflict over wishes for power, or a defensive reaction to magical powers which one is imagined to possess.

In a chapter entitled "Crisis and Transition," Dr. Gilligan says that "moral nihilism is the conclusion as well of women who seek in having an abortion, to cut off their feelings and not care." This denial of feelings is a psychological phenomenon aimed at protecting oneself, but sometimes it exposes one to even greater vulnerability. The term "moral nihilism" simply describes an external phenomenon, but conceals significance behind an "ethical position." The essential issue is that

women who have an unconscious conflict about reproduction may defend themselves against the conflict by driving their feelings into oblivion. Alternatively, women who have resolved unconscious conflict do not feel defensive about magical powers attributed to them, and they are free to express spontaneous feelings as well as to demonstrate their genuine strength.

Dr. Gilligan's conclusion is that in describing their experiences, men and women speak "different languages" which they "assume are the same." From a psychological point of view, men and women share particular conflicts (mutual envy, for example) which arise during early stages of development. They also experience differing conflicts. It is the denial of one's own conflict in one's mate which frequently produces alteration in communication—in Dr. Gilligan's words, "different voices."

In Different Voices shows erudition and presents a point of view which will raise important questions about female development in future years.

Elkins Park House
Elkins Park, PA 19117

The American Philosophical Society

THE American Philosophical Society in that city [Philadelphia] is too well known in Europe to require any particular mention. The library of this distinguished institution has been gradually increased of late years, to a considerable extent, chiefly, I believe, by the indefatigable exertions of the librarian, Mr. John Vaughan, who certainly deserves the thanks, not only of Philadelphia, but of America in general, and I may add, of the scientific public in all other countries interested in American research. He has collected the most complete series anywhere extant of the different Memoirs and Transactions of the various learned institutions established in the old world, which he contrives to keep constantly up to the date of the latest publication; by which means, the most complete facility of reference is afforded to American enquirers at all times. I need not say that the valuable Transactions of the Philosophical Society itself are transmitted, in return, to all those institutions; by which useful interchange, the most important scientific intercourse is maintained with every foreign nation, where letters or physical enquiries are pursued.

This judiciously selected library contains, in a separate department, a complete set of catalogues of all the other public libraries in America, so arranged, that in a few minutes it can be ascertained whether or not any given book is to be found in the country. This ingenious device compensates, in a great degree, to literary men, for the smallness of many of these collections, by enabling them to know what the whole country possesses.

Besides the Philosophical Society, there are various other learned bodies in Philadelphia, of which I shall merely say, that I have seen few similar institutions elsewhere, managed with a more earnest desire to pursue knowledge for its own sake. The inhabitants of Philadelphia, indeed, appear to have more leisure on their hands than those of any other city in the Union; and accordingly, scientific and literary pursuits are there cultivated with much steadiness and success. This circumstance imparts a peculiar character to the style of thought and of conversation in that city, sufficiently obvious to distinguish the inhabitants from those of most other parts of America.

Basil Hall, *Travels in North America, in the years 1827 and 1828*, 3rd ed. (Edinburgh: Cadell, 1830), 2: 366–67.

ESSAY-REVIEW

CABANIS, PIERRE JEAN GEORGE. *On the Relations between the Physical and Moral Aspects of Man.* Baltimore: Johns Hopkins University Press, 1981. Two volumes, 796 pages. Price: $28.50.

Reviewed by STEWART WOLF

IT is a safe bet that very few physicians, medical students, or even medical academics in this country would recognize the name Pierre Jean George Cabanis. Nevertheless, during a period of 50 years extending before and after the French Revolution, Cabanis was, throughout Europe, a dominant figure in medicine and philosophy. He promoted bedside teaching and clinical analysis, and he recognized the importance of neuroregulatory mechanisms in the pathogenesis of disease. He was also among those who early recognized the phenomenon of internal secretion. While pathological anatomy was emerging as the central discipline of medicine, Cabanis, who acknowledged its importance, was more concerned with the study of function and especially with the significance of sensory experience to the functions of the body. His work, therefore, was associated with the beginnings of physiology and of psychosomatic medicine.

Cabanis's *Rapports du Physique et du Morale de L'Homme* was first published in Paris in 1802. The second edition, slightly revised, was published in Paris in 1805. The present two-volume work is an English translation of the second edition, prepared by Margaret Duggan Saidi in 1975 and edited by George Mora.

In the title of this magnum opus the word "moral," derived from *mos*, Latin for "custom," refers not only to ethics but to social behavior, "mores." It implies perceptiveness, motivation, and the exercise of intelligent choice. Cabanis's book explores the connection between man's physical and behavioral functioning and suggests that the brain regulates the two together toward health or illness. It consists of twelve psycho-socio-physiological memoirs or chapters that deal with sensations, emotions, habits, and beliefs, and also with diet, sleep, and climate as they relate to health. The memoirs are introduced by two very helpful essays written by contemporary scholars. One by Professor Sergio Moravia considers the life and achievements of Cabanis in the perspective

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of his time and in relation to his contemporaries. The other, by the editor of the volumes, George Mora, focuses on Cabanis's contributions to neurology and psychiatry and his extraordinary prescient views on scientific philosophy.

Cabanis, the son of a jurist and botanist, was born in 1757 in Rognac in southern France. He graduated in medicine at Paris in 1783 and soon became identified with the idéalogues as a member of the Salon of Mme. Helvétius, widow of the philosopher. The members included such notables as Condillac, Diderot, Thomas Jefferson, Benjamin Franklin, and Caritat, Marquis de Condorcet, whose sister-in-law Cabanis married.

The term idéalogue was attached to the group by the philosopher, Destutt de Tracy, to signify their interest in the analysis, or science, of ideas. Cabanis, who considered that physiology encompasses sociology and psychology and is intimately identified with philosophy, stated that central proposition in his first mémoire, "physiology, the analysis of ideas [ideology] and ethics are but three branches of a single science which may justly be called The Science of Man." The book concludes with an abstract of each mémoire by Cabanis's colleague and fellow senator, Destutt de Tracy. One assertion that he selected for emphasis may give a hint as to the association of Cabanis with Thomas Jefferson:

> Revolutionary shocks are not, as some seem to believe occasioned by the free development of ideas. On the contrary, they have always been the inevitable product of the vain obstacles that are imprudently set to oppose it; and of the lack of agreement between the course of affairs and that of opinion, between social institutions and the state of the minds.

Cabanis came into medicine when doctors in France were held in low esteem and when the medical establishment was in disarray and physicians freely discredited one another. Troubled by the confusion, the prevailing dogmatisms, the lack of rigor of competing theories, and the widespread ignorance about effects of drugs, Cabanis produced a thoughtful and constructive essay entitled, "Du Degré de Certitude de la Medecine." Written in 1788, it was not published until 1798. He brought the work up to date again in 1804. He described the attacks on medicine by physicians as follows:

> Naguere was pleased, at Paris, to mock at medicine, to treat its power as a chimera. This manner of seeing was accredited by a few physicians of reputation, who thought, perhaps, to give a greater idea of the force of their minds by trampling underfoot the very god of their temple. The men of letters, whose bold views had attacked all prejudices, propagated it with all the more eagerness, as they were perhaps a little too habituated to take disbelief for philosophy. All those who wished to pass for being, like them, above all superstitions, thought themselves obliged to repeat to the world of reasonings of Montaigne, the jokes of Molière, or the quips of J. J. Rousseau. We heard it said and repeated every day, that for the healing of illness it was necessary to resort to a prescient and wise nature, by the very people who recognized neither prescience nor rational plan. Those who denied absolutely all the final causes, who considered human existence as the effect of successive accidents, or of the slow apprenticeship of each organ, at the same time believed it impossible to add anything to these accidents by considered combinations, to perfect this appreciceship by trials founded on observation.

Cabanis recognized, as Lesch pointed out, that "the older medicine, if not totally bankrupt, was at least open to grave charges of theoretical uncertainty and practical ineffectiveness. For Cabanis and other thoughtful physicians and scientists the appropriate response to this situation lay not in the abolishment of medicine—as some fashionable critics demanded—but rather in its reform. The older medicine had been too audaciously dogmatic in its theoretical claims, too easily and fully seduced by changing scientific fashion: the result was the incessant clash of mutually hostile sects on the one hand, scepticism on the other. Medical practice enjoyed greater stability, but made little progress. A policy of retrenchment was now necessary. The search for first causes of the phenomena of health and illness, the hasty *a priori* construction of medical systems, the slavish pursuit of scientific fashion, all this must be abandoned in favor of a more cautious empirical approach. Medical theory must become observational, experimental, phenomenalist, analytical."[1]

To read Cabanis is to suffer an acute attack of inferiority. No longer can one find comfort in accustomed protective fictions that say, "there is so much to know that one must limit one's ken" and "there is so much to do that there is not time to think." Contemporary scientific dogma

1. J. E. Lesch, "Origins of Experimental Physiology and Pharmacology in France, 1790–1820," (Ph.D. dissertation, Princeton, 1977, Ann Arbor: University Microfilms).

has taught us that the narrower the path, the further it leads. It is as if the number of available flagstones is limited so that, when arranged too broadly they cannot extend very far. Scientists, therefore, to be taken seriously today, must tread the narrow path, wearing intellectual and professional blinders lest they be attracted to broader challenges and thereby lose their identifying credentials gained through specialization.

Cabanis's field of vision was as broad as humanity. Nevertheless, he had time to talk, to write, to serve the Revolutionary government and again the government under Napoleon, to practice medicine and to think—all this he did in a world of slow travel, nearly devoid of labor-saving and time-saving devices, and one torn by political upheaval and revolutionary terror—the years 1757 to 1808 in France.

These volumes bulge with important and useful lessons in perspective for the present-day physician and medical scientist. Cabanis was able to see and think clearly despite the dust and clamor of the intellectual and political upheaval of his time. Clinical medicine was in parlous confusion. Scientific medicine was in the fragile and painful process of birth. Soon, with the appointment of Magendie to the faculty, its home in France would become the Collège de France. The University faculty in the hospitals of Paris would be left for a time to their wrangling disputes.

Cabanis's perceptions anticipate many revelations associated today with more recent medical scientists and scholars. For example, the sudden cessation of gastric digestion in the presence of fear, usually attributed to Walter Cannon,[2] and on the opposite effect; namely, the acceleration of gastric motility and secretion in emotionally troublesome circumstances that evoke anger, usually accredited to later investigators,[3] were perceived as follows by Cabanis 200 years ago:

> It is a fact that, according to one's state of mind and according to the different nature of the ideas and of the moral affections, the activity of the organs can by turns be stimulated, suspended, or entirely reversed....
>
> A vigorous and healthy man has just eaten a good meal; in the midst of this feeling of well-being the foods that are at the moment carried to the various parts of the organism are energetically digested, and the digestive juices dissolve them easily and quickly. Should this man receive bad

2. W. B. Cannon, *The Wisdom of the Body* (New York: Norton, 1932).

3. Stewart Wolf and H.G. Wolf. *Human Gastric Function: An Experimental Study of a Man and his Stomach* 2nd ed. (New York: Oxford University Press, 1947).

> news, or should sad and baneful passions suddenly arise in his soul, his stomach and intestines will immediately cease to act on the foods contained in them. The very juices in which the foods were already almost entirely dissolved will remain as though struck by a moral stupor, and while the nervous influence that oversees the digestion ceases entirely, that which oversees the expulsion of these residues acquires a greater intensity, so that all the matters contained in the intestinal tract are expelled in a few moments. . . .
>
> Fear destroys and can annihilate the muscular and motor forces. Joy, hope, courageous sentiments can multiply [their] effects tenfold; anger can increase them almost indefinitely. . . .

As fascinating and full of surprises as this book is, it is not easy to read. The sentences are long and convoluted. In translation the prose seems more German than French. Nevertheless the insights afforded and the perspective—missing until now for most Americans—fully justify the labor of reading these volumes.

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A Catalogue of the Manuscripts and Archives in the Library of the College of Physicians of Philadelphia

The College of Physicians of Philadelphia, established in 1787, is one of the oldest and largest medical libraries in the country. The founders were leading members of the American medical profession in the eighteenth century, among them John Morgan, Benjamin Rush, and Adam Kuhn. The College was from its inception a professional society along the lines of the Royal College of Physicians in London. For nearly two hundred years it has been a complement to the medical schools in the city. Its fellowship has consisted of individuals of the highest professional standing. To fulfill the aim of the College to promote the progress of medical science and the medical profession, its fellowship has created a historical library alongside its modern medical research collections which has developed into a superlative collection of medical history, the history of science, and the humanities.

The materials described in this catalogue cover a very wide range: medieval illumitated manuscripts; hundreds of eighteenth and nineteenth century European and American lecture notes; thousands of case histories; archives of institutions such as the famous Philadelphia Orthopedic Hospital and Clinic for Nervous Diseases; papers of leaders of American medicine, such as Benjamin Rush, Robley Dunglison, Samuel D. Gross, S. Weir Mitchell, Joseph Leidy, the Wistar and Wood families; archives from the Anti-Vaccination Society of America to the American Association for the History of Medicine and the archives of the College of Physicians of Philadelphia itself.

The catalogue provides access for the first time to a wealth of untapped resources. No other medical manuscript collection of comparable size has been published in such a catalogue. The bibliographic descriptions are accurate and simple, informing the researcher in a few lines about what he needs to know.

Edited by Rudolf Hirsch, Associate Director of Libraries, Retired, and Professor of History, Emeritus, University of Pennsylvania, the volume is 259 pages. It is available from the University of Pennsylvania Press for $30.00. Fellows of the College of Physicians of Philadelphia may purchase the volume at a 20% discount. ISBN: 0-8122-7817-8

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Authors should submit two copies, typed on one side of 8½ by 11 inch paper; all material, including quotations and references, should be double-spaced. *Transactions & Studies* accepts either footnotes or references, but either must be in accordance with the guidelines in *A Manual of Style* (Chicago: University of Chicago Press, 1969), 12th edition. Prospective authors are encouraged to examine back issues of *Transactions & Studies* to familiarize themselves with the format of the journal.

Photographs and other illustrations may be included. Tables must be typewritten on separate sheets; they should be prepared professionally before submission.

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Noise and Deafness

ROBERT THAYER SATALOFF

DEAFNESS caused by occupational exposure to noise is our most prevalent industrial disease and has been recognized since the Industrial Revolution. At present there are about eight million people with occupational loss of hearing in American industry. Our neglect of hearing loss—especially of occupational hearing loss—has resulted in human and economic consequences that affect virtually every household. This is especially regrettable since deafness induced by noise is almost completely preventable at relatively little cost.

Although good hearing is of inestimable value, it has been appreciated inadequately by the public and even by the medical community. About thirty-five million Americans suffer from hearing loss, and a stigma is still attached to deafness. Little has changed from the days when society had to be admonished: Thou shalt not curse the deaf. While loss of hearing may not be regarded widely as a punishment from God, it continues to be regarded as an embarrassing infirmity or a sign of aging, and it is associated with reduction of sexual attractiveness. It is uncommon for our patients to seek medical attention of their own accord. Usually they deny their impairment and suffer for a considerable period of time before they are dragged into the doctor's office by a member of their family. Patients accept eyeglasses easily, but usually when anyone is told that he needs a hearing aid, his eyes fill with tears. This is every bit as common in our seventy-year-old patients as it is in our teenagers. Few handicaps exceed deafness in their effect on the quality of daily life, and this rule applies even to mild impairment of hearing.

When deafness occurs early in childhood, its devastating consequences are more obvious than when it occurs insidiously in adult life. Normal psychological maturation involves progression from oneness with the mother to definition of the self-image. In this process the child develops patterns of human interrelations and modes of emotional expression. A large auditory deficit in infancy interferes with this process. It delays development of the self-image and impairs the child's expression of his needs. It often results in a speech deficit that further

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impairs his ability to communicate and can result in anxiety, depression, destructive behavior, and tantrums. These troubles may lead to further alienation from the family and often to a permanent deficiency in the child's ability to establish relationships. Severe deafness makes learning a mammoth task for the child, and he frequently reacts with frustration or isolation. The resultant distortion of personality affects the person and his family throughout their lives.

Even the subtle forms of auditory loss can wreak havoc. We frequently see a child who has developed within normal limits but is not doing well in school, is inattentive, and is often considered "not too bright." In such children it is not unusual to discover a moderate impairment of hearing. When this is corrected, the parents invariably report that the child is "like a different person." Fortunately, many of the auditory impairments that lead to these and other consequences are preventable.

When loss of hearing occurs in an adult, more subtle manifestations may be found. Most people with deafness induced by age or noise lose hearing in the high frequencies first; this makes it difficult for them to distinguish consonants, especially *s*, *f*, *t*, and *z*. Hence the patient strains to understand what is being said in everyday conversation. He knows that there is speech because he can hear the vowels, but he cannot distinguish the difference between "yes" and "get." This causes difficulty when he talks to his spouse, goes to the movies, goes to church, or engages in other activities that most of us take for granted.

Deafness is also the unrecognized source of much marital discord. For example, a man who has worked hard for many years in a weaving mill or a boiler factory usually has severe loss of hearing, especially if he has not worn ear protectors. At the end of a work day, he may have a temporary loss of hearing superimposed upon his permanent loss. When he comes home and sits down to read a newspaper, if his wife starts to talk to him from another room (especially if there is competing noise such as that of running water or air conditioners), he will be able to hear her talking but will not understand her words. Before long it becomes so difficult to keep saying "what?" that he stops listening. Soon she thinks he doesn't pay attention to her or love her anymore. Neither of them realizes that deafness underlies their discord. Busy otologists see this scenario daily in their offices. Although we still have no cure for sensorineural deafness, every sufferer from this condition can be helped through counseling and rehabilitation. Despite this, there is little

support for research. Money is constantly requested for problems of vision, cancer, muscular dystrophy, multiple sclerosis, and numerous other diseases, but it is hard to remember the last call for help for the deaf. It is tragic that we allow millions of people to suffer the consequences of preventable noise-induced deafness.

Although recent legislative and legal developments have catapulted the problem of occupational deafness to national prominence, elimination of this condition has been technologically possible for more than thirty years. The delay in addressing the issue has been caused by legislative, economic, and political resistance, as well as by paucity of scientific information adequate for formulation of reasonable standards devised for conservation of hearing and for control of noise. Most occupational diseases and injuries are covered in workmen's compensation legislation but occupational loss of hearing has been included in these laws only recently. Indeed, in some states it continues to be excluded.

Workmen's compensation legislation is based on the principle of reimbursement for lost wages. Because deafness is not visible and usually does not interfere with earning power, it has been neglected despite its effect on *living* power.

Recently the federal government, showing serious concern for this problem, established the Occupational Safety and Health Act Noise Regulation, which mandates hearing-conservation measures in every plant in the United States that produces more than eighty-five dBA of noise for eight hours a day.[1] The government also emphasized its interest in regulations which would compensate federal workers for loss of hearing. This has impelled many states that have recently passed special legislation to include occupational deafness in their workmen's compensation statutes. At a conservative estimate, the potential cost of compensation for deafness in present-day workers exceeds twenty billion dollars. This makes occupational deafness the number one environmental and medicolegal problem in the United States. The number of claims is increasing rapidly and is spurred by layoffs and economic difficulties. However, insurance companies and workmen's compensation funds are not prepared to bear the brunt of this huge and potentially explosive problem, which makes the well-publicized problem

1. dBA is a measure of sound pressure weighted to ignore intense noise at lower frequencies (which are less damaging to hearing) but to focus on potentially damaging noise of higher frequency.

of compensation for asbestosis seem paltry by comparison. The issue is rendered especially disturbing because it has been well documented and publicized since the early 1950s. Many companies in the United States were not willing to invest pennies to protect the hearing of their workers until they were forced to do so. A few companies such as DuPont, which has had a hearing-conservation program for thirty years, established voluntary hearing-safety programs and have virtually no occupational deafness in their employees.

Legislation was delayed by industrial lobbying by companies that did not want to spend money for control of noise or conservation of hearing, but also because the relation between noise and hearing has been difficult to establish. This information is critical in writing a reasonable standard that will protect the vast majority of exposed workers and will be scientifically and economically feasible to implement and enforce. Since Sterner's opinion poll (1952) revealed that even persons knowledgeable about noise and hearing had vastly different notions of "safe" intensities at a given frequency,[2] many authors have contributed to our understanding of noise and its effects on hearing. Most of the important articles written between 1950 and 1971 are listed in Table 9 of the NIOSH (National Institute for Occupational Safety and Health) Criteria for Occupational Exposure to Noise.[3] All these studies had serious limitations, and none of them was sufficiently valid and reliable to be adopted as a basis for establishing standards. Bauhn's analysis of 6,835 audiograms was presented as a collection of scientific data to be used for establishment of criteria of the risks of damage.[4] However, the validity of his statement was challenged by most of the scientific community. The study was flawed by exposures to non-steady-state noise, improper masking of test rooms, vague estimates of noise dosage, auditory fatigue, and improper audiometric testing. Bauhn's raw data were never made available to the scientific community or to the Secretary of Labor's Advisory Committee for a Noise Standard. The investigation published by Burns and Robinson in 1970

2. A. J. Fleming, C. A. D'Alonzo, and J. A. Zapp, *Modern Occupational Medicine* (Philadelphia: Lea & Febiger, 1954).

3. National Institute for Occupational Safety and Health (NIOSH), Criteria document: Recommendations for an occupational exposure standard for noise, 1972.

4. W. L. Baughn, "Relations between daily noise exposure and hearing loss based on the evaluation of 6,835 industrial noise exposure cases," *AMRL-TR*-73-53, June 1973.

was superior to Bauhn's but involved only a small number of workers not exposed to steady-state noise levels below 90 dBA.[5] Johnson reviewed Bauhn's data and showed that 36% of the working population exposed to 95 dBA has hearing loss exceeding 25 dB in the speech frequencies (500 Hz, 1000 Hz, 2000 Hz) after 20 years of exposure, i.e. at about the age of 40.[6] With 100 dBA exposure, the percentage increases to 50%. In textile-weaving rooms with noise levels of about 106 dBA, young employees often require hearing aids after only seven years of unprotected exposure. The first really well controlled and properly designed investigation was the Inter-Industry Noise Study, published in 1978.[7] In this comprehensive investigation, more than 250,000 employees were screened in order to find 290 experimental subjects who met the strict criteria of the study. This exemplifies some of the difficulties responsible for the dearth of reliable scientific information.

Most of the studies and all of the regulations to date have been concerned with continuous, or steady-state, noise. The majority involved plants such as paper mills, textile mills, and metal plants. Recently it has been shown that intermittent exposure to noise has a much less deleterious effect on hearing in the speech frequencies than does continuous exposure.[8] A whole new set of standards may be necessary for intermittent exposure and for exposure to impact noise.

Prevention of noise-induced hearing loss is relatively simple and inexpensive. Although the obvious and most desirable solution would be to quiet machinery and the environment to intensities below harmful levels, this is often impractically costly or scientifically impossible. However, properly worn personal hearing protection in association with audiometric monitoring is extremely effective and inexpensive in the prevention of deafness. Many major industries now have comprehensive programs for the conservation of hearing. These include

5. W. Burns and D. S. Robinson, *Hearing and Noise In Industry* (London: Her Majesty's Stationery Office, 1970).

6. D. Johnson and C. S. Harris, "A Procedure to Correct an Equal Energy Noise Dose for Interrupted or Intermittent Noise Exposures," *AMRL-TR*-78-110.

7. R. A. Yerg, J. Sataloff, A. Glorig, and H. Menduke, "Inter-Industry Noise Study," *Journal of Occupational Medicine* 20 (1978): 351–58.

8. J. Sataloff, H. Menduke, R. T. Sataloff, and R. P. Gore, "Effects of Intermittent Exposure to Noise Upon Hearing," *Annals of Otology, Rhinology, and Laryngology*, in press.

surveys designed to identify hazardous noise, audiometric testing programs intended to reveal auditory impairment from all causes (not just noise), medical analysis of all abnormal audiograms, follow-up for any abnormalities, retraining and monitoring of all testing personnel, audiometric monitoring for the effective use of ear protection, and medicolegal services. Among the many additional benefits of such a program is the recognition of non-noise induced, curable deafness, such as otosclerosis, as well as the early diagnosis of serious causes of impairment such as acoustic neuroma.

More and more, physicians are called upon to consult in occupational otologic problems. When rendering a judgement,it is no longer acceptable to conclude that a person has occupational loss of hearing simply because he works in a noisy plant. The process of diffferential diagnosis is lengthy, and opinions must be established on the basis of positive evidence. Not only are huge sums of money involved (leading to an increase in spurious claims of noise-induced deafness) but many serious causes of deafness may mimic occupational deafness. It is our medical and medicolegal obligation to ferret them out. In order to establish a diagnosis of occupational deafness, one must have at least a history of adequate exposure to noise levels sufficient to explain the impairment, a complete audiogram (air conduction, bone conduction, and discrimination) consistent with noise-induced hearing loss, stability of the level of hearing after the subject is removed from exposure to noise, absence of other causes of deafness, and other data. The differential diagnosis must include presbycusis, noise-induced deafness from recreational (not occupational) causes, diabetes, syphilis, ototoxicity, head trauma, malingering, acoustic neuroma, hereditary deafness, and other causes. Even the typical "4000 Hz dip" audiogram that shows maximum loss of hearing between 3000 Hz and 6000 Hz can be recorded in persons experiencing many conditions other than noise.[9]

Although otologic advances have made almost all forms of conductive deafness surgically curable, sensorineural loss can be treated and potentially cured in only very few conditions, such as Menière's Disease, syphilis, hypothyroidism, and a few others. Despite advances in our understanding of hearing loss and advances in hearing-aid technology which make it possible for us to improve the lives of almost every deaf person, prevention remains our best cure. No widespread disease lends itself better to preventive medicine than noise-induced deafness.

9. R. T. Sataloff, "The 4000 Hz Audiometric Dip," *Ear, Nose & Throat Journal* 59 (1980): 24–32.

Prolonged exposure to noise above 90 dBA is hazardous. Properly chosen and correctly worn ear protectors are safe and effective in controlling the risk. Ear protectors should also be worn to protect against loud recreational noises such as those from chain saws, snowmobiles, motorcycles, band saws, and firearms. With persistent diligence, we are already working to eradicate noise-induced hearing loss in American industrial and military operations. The cost will be minimal. The saving in misery is immeasurable.

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The American Medical Literature

HAVE we a national medical literature? If so, what are its nature and extent?

It required no labored argument to answer these questions. Undoubtedly we have a national medical literature; but that its character and extent are not what they should be, or what we hope they ultimately will be, is equally true. It is an immature, an infantile literature, destitute of bone, and muscle, and sinew, gradually but steadily developing itself, and destined, ere long, to take its place by the side of that of other nations. Literature, regarded in the abstract, has, like the arts and sciences, nay, like governments and nations, its rise and progress, its trials and difficulties, its prosperity, its decline, and its downfall. It does not, Minerva-like, spring in full vigor and perfection from the brain of the heathen god. It does not send forth its rich and fertilizing influences at once upon a people. Its ascent is gradual, its growth tardy, often, indeed, almost imperceptible. To this rule the medical literature of the world forms no exception. What it is, and what it has been, it has become by slow degrees, by hard labor, by indomitable zeal for the national welfare and the national honor. The medical literature of America was conceived in adversity, rocked in the cradle of sorrow, and reared on a diet of bread and water; and yet, as will appear by and by, it is not destitute of value to the possessor, or without honor to the giver. Young as it is, and beset as its progress has been, and still is, with trials and perplexities, it is a living fountain to our profession, from which all who thirst may drink and be refreshed; as a mine of precious ore, abounding in the golden sands of science and erudition. If it lacks the stately proportions of the medical literature of some of the more refined and cultivated nations of Europe, it possesses the vigor of a healthy and steady growth, surely, though slowly, advancing to the full maturity of a sound and sturdy manhood. . . .

From Samuel D. Gross, Report on the Causes Which Impede the Progress of American Medical Literature, *Transactions of the American Medical Association* 9 (1856): 339–362.

Osler and His Publishers

RICHARD H. LAMPERT

IT is by now commonplace to regard Sir William Osler as one of the greatest physicians who ever lived.[1] Any interested physician or medical historian can cite, and often quote, significant contributions or telling epigrams to support this observation. One reason for this widespread appreciation of a physician who died more than sixty years ago is Osler's astounding productivity as a communicator. He lectured—constantly, it would seem—to medical societies and learned organizations from the local to the international level, he wrote letters to editors, case reports, research articles, chapters, and books, and he corresponded prolifically. The mere listing of his written works fills a small volume.[2]

It can be argued that it was through his books that Osler had the greatest impact on the medical profession. Well over 100,000 copies of his textbook, *The Principles and Practice of Medicine*, were sold by D. Appleton & Sons during Osler's lifetime. In addition, 10,000 to 12,000 copies of the first edition of his multi-volume tome, *Modern Medicine*, were sold by Lea & Febiger, and similar totals were attained by the second edition.[3] Other books bearing Osler's name found their way into print, but it is through these two major works that Osler's fame as a physician and a teacher of physicians comes through most clearly.

In retrospect, Osler's relations with the publishers of his two major works were both strikingly modern and thoroughly typical of the enduring but complex loyalties that he assumed throughout his career. In this, as in other areas, we see Osler as both a harbinger and an exemplar for contemporary physician-scholars.

1. Like most papers about Osler, this draws heavily for its basic data from the classic biography by Harvey Cushing, *The Life of Sir William Osler* (Oxford: The Clarendon Press, 1925).

2. M. B. Blogg, *Bibliography of the Writings of Sir William Osler* (Baltimore: The Lord Baltimore Press, 1921).

3. This information is extracted from the four-volume series of cost books of the Lea & Febiger firm, now preserved in the library of the Historical Society of Pennsylvania.

Transactions & Studies of the College of Physicians of Philadelphia ser. 5, vol. 5, no. 3 (1983): 177–190.
1983 by The College of Physicians of Philadelphia.

Negotiations Regarding The Principles and Practice of Medicine

Osler mentioned after the publication of the first edition of *The Principles and Practice of Medicine* that he had "haggled for a few weeks about terms" with Daniel Appleton & Co. before agreeing to sign a contract.[4] Judging from the written correspondence between Osler and both Daniel Appleton and R. B. Granger, Appleton's managing editor, the "haggling" was spirited, to say the least.

As Osler noted on the flyleaf of his first copy (see note 4), he had first considered publishing the work himself and letting one of the two major Philadelphia medical publishers "handle," i.e., market, the book. He received very detailed advice from his good friend Horatio C. Wood in a letter dated October 4, 1890.[5] Wood wrote in part:

> The contracts which I have, virtually make the publisher and authors partners; the cost of the book being deducted from the gross receipts, and these gross receipts being divided between the publisher and the author. Thus, my book is wholesaled by Lippincott at $4.00; assume that it costs $2.00 a volume to put it on the market; there would thus be $2.00 profit, one dollar to me, one dollar to Lippincott.

A handwritten postscript elaborates, "L takes all risk of loss and pays for all advertising. Also all expenses of selling out of his dollar."

According to the written record, Appleton never considered this cost-sharing arrangement seriously. However, it is clear that the company was under some pressure to provide a reasonably lucrative offer to Osler. On January 15, 1891, Daniel Appleton, the president of the firm,

4. Cushing, *Life of Osler*, I: 340, quotes in full the notation Osler wrote on the flyleaf of his personal copy of the first edition: "On several occasions, in Philadelphia, I was asked by Lea Bros. to prepare a work on Diagnosis, & had half promised one; indeed I had prepared a couple of chapters, but continually procrastinated. . . . Dr. Granger, Messrs. Appleton's agent, came from New York to ask me to prepare a Text-Book on Medicine. We haggled for a few weeks about the terms and finally, selling my soul to the devil, I signed the contract. . . . My intention had been to publish the work myself and have Lippincott or Blakiston (both of whom offered) handle the book, but the bait of a guaranteed circulation of 10,000 copies in two years and fifteen hundred dollars on the date of publication was too glittering and I was hooked."

5. Miss M. Fransiszyn, Manuscripts and Reference Librarian, Osler Library, McGill University, Montreal, kindly pointed out the existence of a file in the Osler archives dealing just with the business side of Osler's books. This and other unpublished material cited throughout the present paper was found in that file.

wrote Osler offering him a royalty of 10% of the retail price (Appleton's standard rate) on the first five thousand copies, with 12½% of the retail price on succeeding copies. In addition, the company would guarantee a royalty payment equivalent to the royalties to be earned on 10,000 sales.[6]

Osler apparently asked Wood for advice on this offer, and Wood responded quickly. He wrote to Osler on January 19:

> Whether you ought or ought not to accept the offer of Appleton and Co., depends absolutely on your confidence in yourself and in your book. If the book succeeds, they will make very largely by the offer; if the book fails, or has only a slight success, you will make by the offer. The one point in the offer is the guarantee of the sale of 10,000 copies; the compensation is about one-half what you would get on the other plan. No man positively knows the result of such a book, and an offer like theirs is a kind of gambling one, in which they make a bid on your work against yourself.[7]

At this point, Osler must have decided to find out how likely it was that the proposed book could attain a sale of 10,000 copies. A letter to

6. The Osler archives contain a letter from Daniel Appleton to Osler, dated January 15, 1891, which is quoted here in full:

"Dear Doctor: Referring to the matter of terms offered by us for your work on Practice: we will give you a royalty of ten per-cent on the retail price for the first 5000 copies sold, and twelve and one-half per-cent on all sales thereafter. We will further guarantee that not less than 10,000 copies of the work shall be sold. We are sure that our facilities for pushing the work will insure for it a much larger scale than can be effected by any other publishing house in this country.

"As these terms are exceptional we must ask you to consider this as a confidential communication. An early reply will much oblige."

7. This letter is contained in the Osler archives. The opening of this letter seems to contain within it a small part of a previously untold story:

"Is or is not Professor Wm. Osler a strong, bitter tincture, aromatized with fraud—

"This was the conundrum that harrowed my sleep in the dark hours that preceded the dawn, and though I wrestled until the morning, it still remained unsolved. Some time ago, said Prof. Osler wrote me concerning a book on 'Practice or Diagnosis,' and I gave him all the information in my power. Then said Prof. Osler came to see me, on invitation, and we agreed that we should write the 'Nervous Diseases' for another book of Practice. Then I wrote to said Prof. Osler, laying out the scheme, apportioning the allotments, and asking for opinion, but silence as in the depths of the forest fell like a pall on my budding hopes, for the voice of the Osler warbler was not heard in the land."

Osler from P. Blakiston, Son & Co., dated February 4, 1891, informed Osler that they would count on 1,000 to 2,000 sales of a typical clinical work.[8]

Just two days later, Appleton sent two letters—one from Daniel Appleton and one from R. B. Granger—to Osler, reiterating the company's opposition to the "profit-sharing" approach but improving the royalty rate slightly so that all copies would be sold at the 12½% rate. Daniel Appleton's letter refers to a letter from Osler "of the 4th instant," and Granger's letter talks about a letter of the 5th. Judging from the tone and the specific details contained in the two letters, the two men were answering the same communication. Thus, it is not clear whether Osler wrote simultaneously to Blakiston and Appleton or whether he decided, even after realizing that Appleton's guaranteed royalty offer was an advantageous one, to try enriching the offer by means of a bluff.

To a publisher, Daniel Appleton's letter is remarkably contemporary in tone, right down to his concerns about interest payable on the publisher's investment. Only the numbers seem at all antiquated. For that reason, the letter is quoted in full:

> Dear Sir:
>
> We have your letter of the 4th instant, in which you say that an equal share of the profits would be the only terms on which you could agree for your book on practice.
>
> The terms we have offered you are in reality better than an equal share of the profits. Estimating the cost of a work similar to Strümpell's Practice, which we now publish, we find that the cost of illustrations, stereotyped plates and advertising, with the cost of manufacturing ten thousand copies, amounts to $14,344.77. The book if sold by our Subscription Agency, (by which method the largest sales can be secured,) nets us half the retail price, and in some cases less than that. Assuming that 10,000 copies should be sold at $6.00 per copy, the total profit would be $15,655.23. If we should pay you 12½% copyright, you would receive $7,500.
>
> In our estimate we have not included the interest on our money to be invested, nor the cost of handling nor any of our office or store expenses. On the basis of an equal share of the profits you might have to wait a couple of years before any profit could be declared, or in case the book should not be successful you might never receive anything at all.

8. Osler archives, McGill University.

> Our experience shows that the percentage plan is much the more satisfactory and is really the better for the author, as under this the author is certain of receiving a percentage on the retail fixed price of all copies actually sold by the publisher without any question as to the absolute profits or losses on the book itself.
>
> We are adverse to making an agreement to allow an equal share of profits, as there are always questions arising as to the manner in which the account has been made out, and in the nature of the publishing business it is difficult to estimate what advertising and other expenses should be charged to any one book. This has been the custom with many of the English publishers, which has given rise to so much fault-finding by the English authors.
>
> We should be willing to modify the proposition made to you by giving you 12½% on the first 5,000 copies sold instead of 10% as proposed, but further than this we should not be able to go. Were it not that we have a large list of subscribers to our Medical Library, so that we feel assured of a large sale in adding your book to the Library, we should not make the offer we have.
>
> It is not usual for us to make statements such as we have in this letter as to the profits of any of our books, and we will therefore thank you to keep this communication confidential. It seems to us that the large amount of money to be invested and the risks we are obliged to take, in addition to the experience that we necessarily must have as publishers, justify us in expecting at least an equal share of the profits, and we hope that when you consider the fact that our offer on the whole gives you rather more than an equal share, you will be inclined to consider it favorably.
>
> We remain,
>
> [signed] D. Appleton[9]

Finally, Appleton sent Osler a formal contract, dated February 26, 1891, for "A Treatise on the Practice of Medicine." The contract included a partial payment of the guarantee, amounting to $1,500, on the day of publication.[10] The "haggling" was over, and Osler had accepted Appleton's "glittering" offer.

D. Appleton & Sons was well equipped to make this sort of offer. At that time, the company over-all was regarded as one of the two leading publishers in the United States, along with Harper Brothers. Among

9. Osler archives, McGill University.
10. Osler archives, McGill University.

the company's authors in the latter part of the 19th century were Charles Darwin, Stephen Crane, Herbert Spencer, William Cullen Bryant, and Joel Chandler Harris.[11]

Appleton had not done a great deal of publishing in the health sciences up to that point, but they had been successful at it. Their first publication was perhaps the first great medical book by an American author—George Swett's *A Treatise of the Diseases of the Chest*, published in 1852.[12] (George Swett, not incidentally, was a distant relative of the Appleton family, perhaps explaining why he chose a company noted for its literary publications as the publisher for this major medical work.) Another notable publication in the health sciences was the American edition of Florence Nightingale's *Notes on Nursing*, which Appleton published in 1860.

In any event, Appleton's glittering gamble paid off. The second printing of *Principles and Practice of Medicine* was published just two months after the first. Over-all, the first edition of the work sold some 23,000 copies in about three years, easily exceeding the guarantee figure, and the second sold about 17,000 copies in a similar amount of time. Grace Osler wrote in a letter in 1905—just 13 years after the original publication—that the textbook had reached the 100,000 copy sales level; the hundred thousandth copy had been presented to their son Revere.[13]

Typically, Osler took on any new endeavor with enthusiasm and a full sense of commitment, and the textbook appears to be no exception. Osler frequently wrote letters to professional colleagues, mentioning revisions of the book and appealing for new or corrected information to be incorporated.

Editions of the work appeared at frequent intervals: the first, in 1892; the second in 1895; the third in 1898; the fourth in 1901; the fifth in 1902 (more on that below); the sixth in 1905; the seventh in 1908; the eighth in 1912 (with McCrae). It is remarkable how closely Osler managed to stick to a schedule calling for a new edition of the book every three years. The only interval greater than three years occurred between the seventh and eighth editions.

11. A very valuable perspective on the Appleton Company within its cultural and commercial milieu is contained in a book by Gerald R. Wolfe, *The House of Appleton* (Metuchen, N.J.: The Scarecrow Press, 1981).

12. Wolfe, *Appleton*, p. 77. The book, inevitably, came to be known as "Swett on the Chest."

13. Cushing, *Life of Osler*, II: 707.

There was one very brief interval—a single year separating the fourth and fifth editions. This was the result of a publisher's error. Appleton simply forgot to take out a British copyright, and an unauthorized and much cheaper edition began to cut substantially into the British sales. In order to have a product to copyright, Appleton had Osler make hasty revisions.[14]

As early as 1907 Osler was concerned about the future of his textbook, and he tied it to the department he had recently left behind at Hopkins. In a letter dated April 6, 1907, he wrote to Llewellys Barker:

> It would be possible, I think, to arrange to have the work kept up as a Johns Hopkins Hospital Text-Book of Medicine. I think some arrangement could be made with publishers and some plan devised by which the head of the Medical Department would have ex-officio rights in it.[15]

Osler raised this possibility in another letter early in January 1910, but finally withdrew it in a letter on April 25, 1910. Ultimately, it was McCrae, then at Jefferson in Philadelphia, who took over the book from Osler. Not until the publication of the seventeenth edition in 1968, after a 21-year hiatus, did Osler's dream of a Hopkins textbook of medicine come to fruition, albeit in a very different form from Osler's work.[16]

Osler showed at times that maintaining regular revisions of his textbook was hardly an unalloyed pleasure. For instance, he wrote in 1898 to F. J. Shepherd, "I am over head & ears in my 3rd edition—infernal nuisance."[17] As late as 1912, Osler wrote to Arthur T. Hadley, "I have been hard pressed for the last six months by a revision of my Text-book, unexpectedly forced on me by the publishers."[18] (Actually, given the revision schedule that had been maintained until that point, the publisher was not forcing the schedule; in fact, the revision was mildly overdue.)

14. Ibid., I: 577–78.

15. Ibid., II: 772.

16. This was edited by A. McGehee Harvey, then chairman of the Department of Medicine, and colleagues. Although it is a multi-authored book, all contributions were written by members of that department plus a handful of Hopkins people from other departments. Also, the book was designed to be a patient-oriented or symptom-oriented approach, rather than providing definitive coverage of specific disease entities such as was found in Osler's own editions.

17. Cushing, *Life of Osler*, I: 470.

18. Ibid., II: 1011.

Lea & Febiger's "seduction" of Osler

Given Osler's occasional peevishness about his textbook, it is perhaps surprising that he embarked on a still larger venture, albeit one in which his literary responsibilities would not be as great. This was the multi-volumed work that came to be known as *Modern Medicine.*[19]

It may be that Osler felt that he still, in some sense, "owed" a book to Lea & Febiger, since he had talked with them (one guesses in some detail) about a diagnosis book during the 1880s (see note 4). In addition, he maintained contact with Lea & Febiger through his service on the editorial board of the *American Journal of Medical Sciences.* Thus, Lea & Febiger people would have had opportunities to remind Osler about his "debt" to them.

It is not clear from the written record just how author and publisher came to discuss a multi-volumed work. However, a contract dated May 18, 1904, was sent to Osler in Baltimore, and its terms were exceedingly generous. The contract called for a work consisting of six to eight octavo volumes, averaging eight hundred pages each. The payment to Osler "in full consideration" of his duties in editing the work, would be "$20,000, half on publication of the first volume, half on publication of the completing volume. . . ."[20] It is intriguing to compare the first payment of $10,000 to the $1,500 paid to Osler only twelve years earlier, and the total payment of $20,000 to Appleton's royalty guarantee of $7,500.

The other terms were scarcely less generous. Each contributor was to receive "four dollars per page of printed text matter, exclusive of illustrations" as well as a free copy of the work. In addition, Lea & Febiger promised to "place at the disposal of William Osler, M.D., the sum of Fifteen hundred dollars annually for a period of three years to be applied by William Osler, M.D., in providing himself with suitable editorial assistants." In addition, Osler was allocated $150 per year for a half-time stenographer.

19. Just how the title was selected is not clear. Certainly Osler claimed not to like it. He wrote to McCrae just before publication of the first volume in 1907, "[D]o you like the name Modern Medicine? I do not—who selected it?" (Cushing, *Life of Osler*, I: 763). A month later, he wrote to McCrae, "I suppose we must accept the name *Modern Medicine*" (p. 766). The acceptance of the name went only so far, however; the British edition of the work carried the title *A System of Medicine* (p. 789).

20. Lea & Febiger cost books.

Presumably the contract reached Osler in Baltimore within a very few days. However, the contract was not signed until Charles M. Lea, of the Lea & Febiger partners, called on Osler and McCrae on June 24, about a month later. The importance of that visit is affirmed by the fact that an account of it is contained in the Lea & Febiger permanent record books and is one of the few non-contract documents included therein. It is worth quoting this account in full, because the general tone and nature of the concerns would be familiar to any medical publisher today:

> C. M. L. called upon Dr. Osler and had a very pleasant talk with him and his assistant, Dr. McCrae, the outcome of which was that Dr. O. signed the agreement. He had prepared in part an outline scheme of the work in six and in seven volumes, the former divided unequally, and Dr. McCrae will at once proceed on the seven volume scheme and forward results in a day or so to be put in type. No selection of contributors has yet been made, and this part of the work will probably not be completed before October. In the meantime it will be unwise for us to make any announcement inasmuch as such action would undoubtedly hamper seriously Dr. Osler's movements. In response to an inquiry regarding the outside payments suggested by letter by Dr. O., the latter said that he desired that we supply a stenographer half of the day during the preparation of the work, and the one he has selected for the purposes has been receiving about $300.00 a year, so that our costs for this purpose will be about $150.00 annually. Regarding our payment of a portion of the expenses of Dr. McCrae abroad, Dr. O. in an off-hand way said they would come to about $200. Of course these figures are not accurate, but they sufficiently indicate what we wish to know.
>
> Regarding our payment of $1500.00 per annum to Dr. McCrae, I should think that it might well commence with July 1, 1904, though no mention was made of this matter with Dr. O. If it does come up, we can claim June 24th as the date upon which the agreement was signed although the latter has the date of May 18th.

At this time Lea & Febiger was contracting for a number of multi-volume, edited works similar in over-all design to *Modern Medicine*, yet in none of those other cases are the financial terms as generous. For instance, we can note that the publisher committed a payment of $20,000 to Osler for a work projected to be about 5,600 pages—just over $3.50 per page as the editor's payment to Osler, in addition to the $4.00 per page for contributors and the so-called "outside payments." In the

contract for one comparable work, *Medical Treatment* (Hobart Amory Hare, editor), the publishers offered the editor $3,000 for a work that was expected to run about 1,600 pages in all—just under $2.00 per page for the editor, plus $3.00 per page for the contributors. Hare's contract was written about six years after Osler's. On a number of contracts written during the 1890s, Lea & Febiger offered a payment of about $2.00 per page for the editor, along with $2.00 per page for contributors.[21]

The Making of Modern Medicine

Armed with this very generous commitment, Osler got down to work, evidently with considerable ambivalence. He wrote to Llewllys Barker on November 27, 1904, "In a weak moment I consented to edit for Lea Bros. a new System of Medicine. McCrae will do all the rough work as assistant editor."[22] The very next day, he wrote to Prof. Arthur Thomas, "I am really tied by a heavy literary venture for which I had signed the contract in June—a new System of Medicine—and the publishers would not let me free."[23] Even while well along in bringing out the first edition, he wrote the following to H. P. Bowditch: "I have been working at my System of Medicine—wretched thing! Five volumes of which are out and two to follow—and at some other back articles. You were never the same soft hearted fool and accepted everybody's invitation to write. . . ."[24]

For a "soft hearted fool," Osler managed to take full advantage of the generous contract terms and in fact stretch them a bit. The Lea & Febiger company cost books show, for instance, that they accounted for payments to McCrae at $1,100 per volume for seven volumes—roughly five and a half years' worth of assistant's stipend, rather than the three that Lea & Febiger promised in the contract. There may also have been a bit of "creative accounting" at Lea & Febiger in that the stenographer's payments and McCrae's travel expenses are not charged directly to the work. Osler also took advantage of extensive proof corrections. His contract with Lea & Febiger allowed author's alterations up to 15% of the original composition bill, a customary percentage at that time.

21. Ibid.
22. Ibid.
23. Cushing, *Life of Osler*, I: 661.
24. Ibid., II: 842.

However, Osler ran up much higher alteration bills and apparently was not charged for them. His "aa" percentages ran between 21 and a breathtaking 57% in the seven volumes. Over-all, his alterations ran at the rate of 29%, roughly double his allowance (Table I). All in all, it must have been an uncomfortable situation for the Lea & Febiger management.[25]

Table I

Author's Alterations to Modern Medicine

Volume	Cost of Composition	Cost of Alterations	Percentage Altered	Allowable Alterations	Excess Alterations
I	$ 588.80	$338.01	57.4%	$ 88.32	$249.69
II	426.16	110.50	25.9	63.92	46.58
III	861.05	183.04	21.3	129.16	53.88
IV	1327.60	285.30	21.5	199.14	86.16
V	1007.44	357.64	35.5	151.12	206.52
VI	912.77	247.05	27.1	136.92	110.13
VII	1263.38	349.20	27.6	189.51	159.69
				TOTAL:	$912.65

Still, the work did well commercially. On the first two volumes, the publisher produced a first printing of only 5,000 copies. Even with those relatively modest printings, however, the cost books indicated that Lea & Febiger would amortize the fixed costs—composition, payments to contributors, and McCrae's stipend—over a total of 10,000 copies, thus indicating the belief that there would be later printings of the volumes. Sales of the work were brisk enough so that the first print quantities on Volumes III through V were in fact 10,000 copies; on Volumes VI and VII the quantities were 12,000 copies per volume.[26]

25. Lea & Febiger cost books.

26. Ibid.

By 1912, of course, Osler and Lea & Febiger were launched on a second edition of the work, thereby showing that the first edition could not have been a financial disaster to the publisher. Osler evidently realized (or had been told by the publishers) that there had been some financial pressures on the first edition. In a previously unpublished letter dated November 16, 1915, Osler wrote to Lea & Febiger in part:

> I do hope that Modern Medicine has been a success financially. It has been a great pleasure to have my name associated with a publication of your firm. I only wish you had had my text book![27]

Nothing in the published record indicated that Osler was unhappy at this time with Appleton. Conceivably, then, the last sentence of the letter was another manifestation of Osler's guilty conscience over the New York devil to whom he had originally "sold his soul." Certainly the textbook was an unqualified financial success almost from the day it was published. Aside from the royalty advance on day of publication and the quickly-met guaranteed sale, there was nothing extraordinarily generous in the Appleton contract. At this point, Appleton was reaping the dividends that accrue to any publisher who manages to publish an enduring classic, and Osler may have been apologetic for the fact that such dividends would not accrue so readily to Lea & Febiger on *Modern Medicine*.

Modern Medicine did carry on through one edition, the third, after Osler's death. Of course, McCrae, then well established at Jefferson Medical College, was the editor of the work, so once again the Hopkins link was lost. The terms of McCrae's contract (dated March 4, 1924) were, reasonably enough, not as generous as those in Osler's. His payment was set at a total of $10,000, and he was allowed a *total* of $2,000 for an assistant editor. Contributors of new material were to receive $4.00 per page, but revised material was allowed only $2.00 per page.[28]

One can argue that most of Osler's commitments turned out to be lifetime commitments, at least emotionally. His consistent concern for, and generosity toward, McGill and The Johns Hopkins Universities, to the medical societies in and around Baltimore, and to the state of Maryland, and his continual contact with the American medical profession in general are all noteworthy—and frequently noted—examples.

27. This letter is currently in the possession of John Febiger Spahr, one of the present partners at Lea & Febiger.

28. Lea & Febiger cost books.

Similarly, Osler did work very diligently in producing regular revisions of both his major works. Furthermore, he apparently was concerned about the orderly and appropriate transition in authorship for both his books. His concrete and apparently sincere desire to have his textbook become a Hopkins departmental property indicates his loyalty to the medical institution and the teaching philosophy he helped to develop. (The timing of the correspondence regarding a Hopkins succession is interesting in itself. It corresponds to the final stages of work on the first edition of *Modern Medicine*, and it is conceivable that Osler realized that he had simply taken on too heavy a load of books.) The ultimate succession in authorship of both the textbook and *Modern Medicine* shows, of course, Osler's characteristic loyalty to an old and trusted colleague. Thomas McCrae provided a great deal of help to Osler in his clinical work at Hopkins and clearly became a valued editorial colleague. Even though McCrae made his academic career in Philadelphia, there could be no doubt that he was a product of Osler's era in Baltimore.

In addition, Osler dealt with his publishers as he had dealt with all the medical schools which employed him or sought to employ him. He placed a high value on his own abilities and efforts and apparently was a shrewd enough negotiator to win extensive yet not unreasonable concessions. In the case of medical schools, the concessions involved teaching duties, organization, facilities, and the like; in the case of commercial publishing, Osler obtained concessions at the heart of the commercial enterprise—cash and financial guarantees.

It is also worth noting that Osler demonstrated in the case of his publishers, as well as the institutions he served, what might be called "overlapping loyalties." During his era the common pattern was for an individual to stay for his entire career in a prestigious chair. Osler, of course, made significant contributions to four major institutions in his career. Similarly, most authors of the time—medical or otherwise—tended to remain with a single publisher. Osler did not, choosing Appleton and Lea & Febiger for his two major works and publishing medical monographs for the most part with still another Philadelphia company, Blakiston. Osler's movement from chair to chair and from publisher to publisher are far more familiar in this modern era, and in that sense Osler can be said to prefigure today's career and publishing patterns.

In the end, no medical institution and no publisher could feel shortchanged by Osler. His books were commercially successful, and in Appleton's case his came to be the first of an extensive parade of important texts from the Hopkins.

During Osler's time at Hopkins, Appleton also published *Obstetrics* by J. Whitridge Williams (now *Williams Obstetrics*, 16th edition, by Pritchard and MacDonald), and *Preventive Medicine and Hygiene* by Milton J. Rosenau (now *Maxcy-Rosenau Public Health and Preventive Medicine*, 11th edition, edited by Last). Each of these books is still regarded as the classic American text in its field. There were other important books, as well—*Tuberculosis* by Klebs, *Tropical Medicine* by Shattuck, two gynecology texts by the enigmatic Howard Kelly, and so forth. This is a typical pattern for any institution that Osler ever touched— the continuing growth that derived either from Osler's direct influence or simply the reflected glory that the name "Osler" could bring.

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The Royal College of Physicians of London During the Reign of the House of Stuart (1603–1714)

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THE Royal College of Physicians of London is today one of the most important British medical institutions. Its history extends back more than four and one-half centuries to 1518, when it was established by permission of Henry VIII, the second Tudor king. Medievalists undoubtedly could trace remoter origins in certain of the guilds of "physycans" and "chirurgions" which preceded it. The present essay is devoted chiefly to its history during the Stuart period (1603–1714). Such an approach, excluding as it does three-fourths of the total span of the College, is necessarily less than complete but it permits a close view of a transitional period during which the College, or certain of its members, developed or adopted some new ideas of science and medicine. The College of these years is also an outstanding example of the corporate institutions which were powerful and important in the seventeenth century.

This essay discusses both medical and institutional aspects of the College's history under the Stuarts. There are three major points of reference. The first is an examination of the purpose and privileges of the College, as expressed formally in its charter and by-laws, and informally in its customs. The second is a consideration of efforts of the College to retain and expand its privileged position, as revealed by disputes with rival groups—organized, as the Apothecaries and the Barber-Surgeons, and unorganized, as the healers and quacks. The third and last is a brief review of seventeenth-century medical practice, and of such important improvements in medical practice and science as are related to the Royal College of Physicians.

Purpose, Structure, and Privileges of the College

The creation of the College resulted from the necessity of finding a means of control over numerous unlicensed practitioners. Properly trained physicians were few and quacks and empirics flourished in their stead. Henry VIII's solution was to require all medical practitioners of London to submit to an examination, under which only the more

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worthy would be licensed. At first, in the Act of 1511, he empowered bishops to grant licenses to practice, specifically the Bishop of London and the Dean of St. Paul's. When this arrangement proved ineffective, he adopted the suggestion of Thomas Linacre, the noted physician and humanist, that a small group of London physicians be authorized to issue licenses and to regulate medical matters. In 1518 Henry incorporated these men into a perpetual Commonality or Fellowship, to be styled the College of Physicians, which was to "be established for the Honour of the Kingdom and the Health of the Publick" and was to "be defended with Privileges [and] enrich'd with Possessions. . . ."[1]

The most important of its privileges was that which denied the right to practice medicine in London or within seven miles thereof to any person not licensed by the College. Such authority was extended, in 1522, to include all of England. One exception allowed physicians who were graduates of Oxford or Cambridge to practice freely outside London. But within the city and its suburbs all physicians were subject to the College, which had ample power to prosecute, fine, or imprison offenders.[2] Another exception was that in the provinces the examination of physicians was to be carried out by the College but the license was to be bestowed by bishops or their vicars general.[3] Ecclesiastical licensing authority was technically revoked in 1687[4] but continued to be exercised as late as the middle of the eighteenth century.[5]

1. *The Statutes of the Colledge of Physicians, London: Worthy to be perused by all men, But more Especially Physicians, Lawyers, Apothecaries, Surgeons, and all such that either do, or shall Study, Profess or Practise Physick* (London, 1693), p. 3. It is rather uncertain when the College was accorded the right to use "Royal" in its title. Present indications are that the usage is derived from a Charter of Charles II (1660–1685) that was "not accepted." (The 1693 edition of the Statutes was an unofficial publication.)

2. Christopher Merrett, *A Collection of Acts of Parliament, Charters, Trials at Law, and Judges Opinions Concerning Those Grants to the Colledge of Physicians, London, taken from the Originals, Law-Books, and Annals* (London, 1660), pp. 3–11. This indispensable volume lists all privileges mentioned in this paragraph and below. See also *The Charter, Bye-Laws, and Regulations of the Royal College of Physicians of London and the Acts of Parliament Especially Relating Thereto* (London, 1892), pp. 9–16.

3. The author is indebted to Mr. L. M. Payne, former librarian of the Royal College of Physicians, for clarifying this point. Letter of L. M. Payne to D. B. Cooper, Nov. 13, 1959.

4. "The Manuscripts of the College of Physicians," *Eighth Report of the Royal Commission on Historical Manuscripts*, Reports and Appendix, Part I (London, 1881), p. 230 (hereafter cited as *R.C.P., H.M.C.,8th*).

5. C. R. B. Barrett, *The History of the Society of Apothecaries of London* (London, 1905), p. xvii.

There were numerous compensations to College members for assuming such broad supervisory duties, which must, at times, have proven onerous to busy professional men. Collectively, they were allowed the use of a common seal, the right to hold assemblies, to make statutes and ordinances for the administration of the College, to hold in fee lands and tenements, and rents and possessions up to an annual value of twelve pounds. Personally, within London and its suburbs, they were exempted from constabular duty, from keeping watch and ward, from bearing and providing arms, and from summons on all assizes, inquests, and juries. Some privileges came at the expense of rivals. Thus certain officers of the College were authorized to inspect apothecary shops and to destroy any defective medicines that were found. For refusing entrance to the searchers the apothecary risked prosecution by the College. Another privilege came at the expense of the barber-surgeons, inasmuch as physicians were allowed to practice surgery freely, while surgeons, without a special license from the College (rarely bestowed), could not practice medicine.[6]

Further concessions came in later years. In 1564, Queen Elizabeth gave the College permission to claim annually the bodies of four executed felons for anatomical demonstrations. Each sovereign reaffirmed grants made by predecessors. Thus in 1663 Charles II issued a "grant to the President, Fellows, etc., of the King's College of Physicians in London, of Incorporation, with confirmation of former privileges, and some additions."[7]

While all members shared the general privileges discussed above, there were within the College four grades of membership which reflected differing levels of acceptance and preferment. These were, in the order of their importance, Fellows, Honorary Fellows, Candidates, and Licentiates. During most of the century the Fellows were limited to forty, plus the royal physicians; a new charter issued in 1687 by James II raised the number to eighty.[8] Fellowship always implied superior training, such as the M.D. degree, and also English citizenship, although these in themselves, especially in the later years of the seventeenth century, were no guarantee of election. An anonymous critic accused

6. Merrett, *A Collection of Acts*, pp. 3–11.

7. *Calendar of State Papers, Domestic Series, 1663–1664*, [?] vols. (London, 1856 ff.), p. 95 (hereafter cited as *C.S.P., D.S.*).

8. Charter printed in full in Merrett, *A Collection of Acts*, pp. 37–64.

the College of deliberately excluding many worthy physicians "without any respect of their Due and Legal Qualifications, and abilities."[9]

Only Fellows were eligible to hold office in the College. The most important office, aside from the Presidency, was that of Elect. There were eight of these and they formed an exclusive inner council in the College. They were a self-perpetuating body which enjoyed the double privilege of filling vacancies within their own number and of naming one of themselves to the Presidency. Presumably they were chosen from among those Fellows "who for gravity, learning, manners, and age, excel the rest." Sitting as a board of licensure, with a quorum of three, the Elects determined which applicants were qualified to practice medicine.[10]

The Censors were also chosen solely from the Fellows. They were directly responsible for supervising and regulating medical practice in London. It was they who were "to search the Apothecaries Shops, to judge of their Medicines, to burn, or any other ways to destroy the corrupt . . ." medicines found therein.[11] If any legal proceedings against recalcitrant apothecaries or unlicensed practitioners were required, this matter was handled by the Censors.

Honorary Fellows were admitted for the first time in 1665. They enjoyed full privileges of Fellowship except eligibility for office. They comprised such "Doctors in Physick, as by reason of their being Foreigners, or having taken their Degree in some University beyond the Seas, are not incorporated into either of ours." This grade of membership was an outgrowth of the mid-century Civil Wars, as it applied to those "who thorow the iniquity of the times, were forced from the Universities, and so could not orderly take their Degrees at home; but were compelled to take them abroad in Foreign Universities." This meant royalists, of course, and in particular the King's physicians. The original purpose of the Honorary Fellowship became subverted, however, into an *entrée* into the College for less qualified physicians. The College was accused of "admitting all foreign Degrees, or any else (without Examination, for money, 80 or 100£) into an order, which the Statutes have not ordained."[12]

9. *Statutes*, p. 2.

10. Ibid., p. 7.

11. Ibid., p. 36.

12. Ibid., pp. 8–9. Mr. L. M. Payne has informed the author through correspondence that "the admission of honorary Fellows was forbidden by the King in 1674/75. In 1680 an attempt was made to revive and extend the class but it was with the obligation of

Next in rank were the Candidates, who were limited by statute to twelve.[13] Candidacy, a probationary grade, usually led to Fellowship within two or three years. On some occasions the Candidate never advanced to Fellowship. A physician became a Candidate by passing a complicated examination, which was occasionally waived. Candidates also, of course, were required to possess both the M.D. degree from an English university and English citizenship. Many had foreign degrees, which necessitated the act of incorporation with either Oxford or Cambridge. By the seventeenth century this was largely a formality.

The crown, particularly the later Stuarts, often intervened in College affairs to seek admission of favorites. Royal physicians were customarily, but not automatically, admitted to Fellowship.[14] In some cases the King sought to force the universities to grant the M.D. degree to one of his favorites. Without this degree a physician was of course ineligible for Fellowship. In a case involving Cambridge University Charles II said, "Having received good testimony of the learning of Thos. Spencer . . . we require you . . . to admit him to his M.D. degree, he paying the usual fees, and performing the exercises, or giving security so to do."[15]

There was some Parliamentary interference in requirements for membership in the College. This is best illustrated by religious enactments. In 1679 "the Lords . . . renewed the consideration of Religion, extending their zeal against Popery to the deprivation . . . of Papists . . . from all placed of profit and trust . . . and comprehending under that motion (places and offices of profit and trust) all Colleges and Societies, as physicians and lawyers."[16] Thus the College was ordered to "expel all such as are not protestants."[17]

The lowest rank within the College was that of Licentiate. After passing the examination conducted by the Elects they were licensed to practice medicine inside London or within seven miles thereof. "Licentiates, are such other persons skilled in Physick, who by reason of their being Foreigners, or their not being admitted Doctors in one of

undergoing at least one of the statutory examinations. These honorary Fellowships were not in much request and they ceased to be granted after January 1725/26." L. M. Payne to D. B. Cooper, Nov. 13, 1959.

13. *Statutes*, p. 79.

14. *C.S.P., D.S., 1668–1669*, p. 59.

15. *C.S.P., D.S., 1670*, p. 314; also p. 336.

16. *Calendar of the Manuscripts of the Marquess of Ormonde, K.P.*, Historical Manuscripts Commission, n.s., vol. 5 (London, 1908): 10 (hereafter the Historical Manuscript Commission is cited as H.M.C.).

17. *R.C.P., H.M.C., 8th*, p. 230.

our Universities, or for their not being eminently learned, or by reason of their too great youth, or such like causes, are not capable to be elected into the number of the Candidates."[18] Some Licentiates, who met all the requirements, including possession of the M.D. degree, were still denied admission to Candidacy. However, the legal right of the College to exclude MDs from Fellowship is evident. "A doctor of physic, who has been licensed by the College of Physicians to practice physic in London and within seven miles, cannot claim as a matter of right to be admitted a fellow of the College."[19] It is ironic that Thomas Sydenham, the man considered the greatest English physician of the century, after William Harvey, was a Licentiate, who—documentation is unavailable to the author on this point—may have been denied election to Fellowship since he was thought to have been a dissenter or low churchman.

There was a fifth grade of practitioners, not members of the College, who were known as Extra-Licentiaties and who were licensed to practice medicine outside of London. Most of them were not MDs, though many had degrees in arts, and they were at the nether end of legally recognized seventeenth-century English physicians. They were not subject to the same rigid examination as London practitioners. Actually very few country "doctors" were licensed by the College, though many were licensed by the Church.[20] For the first quarter-century Munk's *Roll* lists only five Extra-Licentiates, while the totals for the final three quarters are seventeen, fifty-two, and eighty-eight respectively.[21]

From these figures it is obvious that, at least in rural areas, the College was not fulfilling its original purpose of improving medical standards by denying licenses to unskilled practitioners. John Raach writes that seven-hundred and thirty-one physicians are known to have practiced in the country districts of the midlands and south of England from 1503 to 1643.[22] Yet according to Munk the College licensed no more than twenty-two physicians for all of rural England during these years.

18. *Statutes*, p. 9.

19. *The English Reports*, 82 (London, 1908): 976.

20. John H. Raach, "A Seventeenth Century English Medical License," *Bulletin of the History of Medicine* 13 (Feb. 1943): 213–14.

21. William Munk, *The Roll of the Royal College of Physicians*, 3 vols., 2nd ed., rev. and enlarged (London, 1878).

22. Raach, "A Seventeenth Century English Medical License," p. 216, n. 16.

The College made at best only sporadic attempts to prosecute unlicensed rural doctors, yet it had clear legal power to do this. In 1627 there was issued "an open warrant with generall direccions to all his Majesty's public officers commanding them to be ayding and assisting to the President of the Colledge of Phisitions for the executing of the lawes and statutes of the realm about the apprehending of such persons as doe unlawfully practise or use physicke."[23]

Within London the Censors were more aggressive. In 1647 William Trigg was "prosecuted and sentenced to pay a large sum of money for practicing physic in London without being admitted by the President and College of Physicians."[24] Trigg, however, won a reversal in his favor with an appeal to the House of Lords, from whose *Journal* for 1647 we learn of "The Petition of [William] Trigg, Doctor of Physic, read; and granted" and that "Mr. Solicitor shall sign a warrant for a Writ of Error."[25] In 1617 Dr. Thomas Bonham was fined sixty pounds "for practicing for a year, without license from the College of Physicians."[26] In 1670 Adrian Huybert, "practitioner in physic," was sentenced to pay a fine of one hundred pounds "for practicing physic, not being of the college."[27] Huybert evened the score in 1678 when he "printed a scandalous pamphlet about the College."[28]

The Censors were never consistent in their prosecutions. Gideon Harvey, the notorious quack who enjoyed royal favor, defied the College openly and was never prosecuted.[29] Richard Shryock believed that the College gave more attention fo prosecuting unlicensed graduates of rival universities than to quacks.[30]

The most important function of the College, besides licensure, was to act as a semi-official advisory or consultative body. Throughout the century its opinion was sought by a great variety of persons on small

23. *Acts of the Privy Council of England, 1627*, 423 vols. (London, 1890–1938), p. 83 (hereafter cited as *A.P.C.*).

24. "The Manuscripts of the House of Lords," *Sixth Report of the Royal Commission on Historical Manuscripts*, Part I, Report and Appendix (London, 1877), p. 176.

25. *Journal of the House of Lords, 1647*, p. 197.

26. *C.S.P., D.S., 1611–1618*, p. 510; see also Merrett, *A Collection of Acts*, pp. 75–78.

27. *C.S.P., D.S., 1670*, p. 619.

28. *R.C.P., H.M.C., 8th*, p. 230.

29. H. A. Colwell, "Gideon Harvey: Sidelights on Medical Life from the Restoration to the End of the XVII Century," *Annals of Medical History* 3 (Fall 1921): 209.

30. Richard H. Shryock, "Public Relations of the Medical Profession in Great Britain and the United States: 1600–1870," *Annals of Medical History*, n.s. 2 (May 1930): 309.

matters and large. In 1628 Charles I was anxious to suppress the domestic cultivation of tobacco. No doubt this aim was furthered when the Elects declared that English tobacco "as it is now usually taken . . . cannot be but very unwholesome and hurtful."[31] In 1627 the Aldermen of London asked that the "President of the Colledge of Phisicions, accompanied with six other doctors of that societie" should offer their opinion concerning "an unsufferable and contagious annoyance caused by certain allome works." When the committee, which included William Harvey, decided "that the works . . . must necessarily breede great annoyance" they were closed down.[32]

The humbler sort of people also consulted the College. In 1626 one Nicholas Harris, a poor old man, who had been denied placement in the Almshouse of Totnes because the magistrates considered him "an uncleane manne, and a leper," was examined by a committee and declared to be "free from the imputed disease."[33] The College often gave evidence in legal matters, as in 1632 when it testified that an apparent murder victim had in fact been dispatched by poison.[34] In another instance one William Walcot, seeking a patent for a process to freshen sea water, told the House of Lords, "We have the testimony of the College of Physicians that we make salt-water fresh."[35]

The crown routinely consulted the College regarding selection of qualified personnel, proper medicine, foodstuffs, and supplies for the armed forces. Thus in 1692 Lord Nottingham asked the College to recommend an able physician to accompany troops to the West Indies, and to suggest an apothecary who would be placed in charge of the medical stores.[36]

31. J. J. Keevil, "Theodore Goulston, M.D., F.R.C.P., 1574–1632," *Bulletin of the History of Medicine* 27 (May–June 1953): 208.

32. *A.P.C., 1627*, pp. 433–34, 444–45.

33. "The Corporation of Totnes," *Third Report of the Royal Commission of Historical Manuscripts* (London, 1872), p. 348.

34. *R.C.P., H.M.C., 8th*, p. 230.

35. *The Manuscripts of the House of Lords, 1692–1693*, H.M.C., Fourteenth Report, Appendix, Part VI (London, 1894), p. 378.

36. *R.C.P., H.M.C., 8th*, p. 231.

Rivalries and Struggles

The College of Physicians was not the only legally recognized medical corporation. In an amusing example of Tudor efficiency, the human body had been divided up, legally speaking, and the various areas were entrusted to separate guardians. Under the Stuarts physicians continued to enjoy a monopoly for the treating of internal disorders. External problems, such as the setting of fractures or the dressing of battle wounds, were considered by the physician to be beneath his professional dignity and were conceded to the surgeons. For example, in 1645, during the Civil War, in "an accompt of the being and welbeing . . . of wounded men" who had suffered injury in fighting near Bristol, it is mentioned that "nurses and chirurgions" were staffed in the "hospitall," but nothing is said of physicians.[37] A third medical group, the Society of Apothecaries, was incorporated in 1617. Its status was not defined clearly. This caused bitter quarreling with its two older rivals, both of whom feared encroachment by the newcomers on their own traditional privileges.

All three groups were sensitively conscious of their own status to an extent which seems unreasonable today. They functioned, however, in a century of restricted social mobility, but one in which gains or losses in status could be registered in competition with those rivals who ranked close to themselves. Personal prestige came from the prestige of one's own group; this created an indwelling, fragmented social organization in which outsiders could well be rivals. The socially advancing groups neither sought nor expected any radical gains, while the established groups championed the safety of the existing state of affairs. Within their own little bailiwicks, however, there was much inter-group jockeying for position at the expense of next-door neighbors, as each group sought as much freedom of action to increase its own status as it was possible to obtain. Freedom was measured in terms of broad legal privileges which ideally were monopolistic. The object was to be the only frog in the local pond, rather than the largest. Conversely, complete freedom was the absence of any legal restraints, or complete lack of responsibility to any other frogs. This is easily seen on the individual level. When an apprentice completed his term of bondage he became free. For example, in a list of surgeons who practiced in London in 1641, there is mentioned one Edward Fleete, who was

37. *The Manuscripts of his Grace the Duke of Portland*, H.M.C., 10 vols. (London, 1891–1931), 1: 309.

"apprenticed to James Mullyns (Molins) at Barber-Surgeon's Hall, 1610/11, and took the Freedom in 1617/18."[38] Since Fleete now had no master, he was free of legal restraints and was eligible to share in the privileges of the Company of Barber-Surgeons. Had he not been free, this would have been denied him. As a privileged member of the Company, his own status rose or fell with that of the group. Thus, by extension, each group suspected all rivals of encroaching on its own special preserve. This helps to explain the bickering among the three rival medical societies.

Relations between the College of Physicians and the society of Apothecaries were particularly strained, and remained so throughout the seventeenth century. In 1606 the apothecaries were included within a charter granted to the Company of Grocers, but the union was unhappy and the apothecaries sought separate maintainance. As early as 1614 the King signed a bill creating their own Company, but jealous opposition of the Grocers, aided and abetted by the College of Physicians and others, induced the King to keep the bill from passing the Great Seal until 1617.[39] The petition of the Grocers, aided by the physicians, is an impassioned plea for maintenance of the existing status, and their own little monopolies with it.

> 29 May, 1614. A letter to the Lord Cheife Justice of England and Sir Thomas Lake.
> ... the Lord Maior and Aldermen of the citty of London [are said to fear] ... inconvenience may fall upon that government by occasion that the Apothicaries of London ... doe now goe about to devid themselves from that company [Grocers], and have endeavored to obtaine from his Majestie a particular corporacion for themselves . . . to the great innovacion and change of the government of that cittie.... [Thus] wee ... pray and require your lordships, etc. to call before yow, as well some such of the Colledg of Physicians as you shall thinke meete, as also such Apothicaries as shalbe named unto you by the Grocers . . . of by the physitions.... that such order may thereupon be taken for preservation of the auncient government of that cittie. . . .[40]

38. R. R. James, "A List of Surgeons in Practice in London and its Suburbs in 1641," *Bulletin of the History of Medicine* 19 (March 1946): 283.

39. *A.P.C., 1613–1614*, pp. 450–51; *A.P.C., 1614–1616*, p. 32.

40. *A.P.C., 1613–1614*, pp. 450–51.

Despite its powerful enemies the new Company survived, as did its enmity toward the College of Physicians. In 1635 the College informed the Privy Council that since obtaining a charter the number of apothecaries had increased so "as not possibly to be governed by the College."[41] The Censors, however, denied that the College had been overly zealous in prosecuting malpracticing apothecaries. "In 40 yrs. not above eight have been discommoned, and of these five are brought for judgment before the Star Chamber." Furthermore, the College "never searched nor destroyed any drug but as by Act of Parliament in prescribed." The College concluded that the purpose of the apothecaries' recent petition was to "show even before the Lords their respect to the college be none at all."[42]

The two rivals aired their differences in a lively pamphlet warfare. The most venomous blow struck by a College member against the apothecaries came from Christopher Merrett, former librarian of the College. In 1670 he published a slender volume entitled *A Short View of the Frauds, and Abuses Committed by Apothecaries As Well in Relation to Patients, as Physicians; and of the Only Remedy thereof by Physicians making their own Medicines*. The tone of the title is the tone of the text. Although congratulating himself on his "mildness of Spirit, the language" Merrett says the apothecaries were the "Common Enemy" and perhaps "*the veriest Knaves in England*." "The frauds of them committeed [he wrote] relate either to their falsifying of *Medicines*, or secondly, to the number of their Bills, and prescriptions, or thirdly, to the prices of them." They were also guilty, said Merrett, of falsifying the compositions of the official pharmacopoeia, adulterating their medicines with honey and other cheap ingredients, and of using bad or decayed drugs. Further, these "cheats" have "always endeavored and aimed at the depression and ruine of the *College of Physicions*" and "have continually traduced the *College*, and troubled them in *Parliaments*, at the Council Board, &c."[43] When the apothecaries asked that Merrett's book be disavowed officially, the College refused.[44]

41. *C.S.P., D.S., 1635*, pp. 532–33.

42. *C.S.P., D.S., 1637–1638*, pp. 358–59.

43. Christopher Merrett, *A Short View of the Frauds, and Abuses Committed by apothecaries as Well in Relation to Patients, as Physicians; and of the only Remedy thereof by Physicians making their own medicines* (London, 1670), pp. 7–10, 13, 47, 69.

44. Barrett, *The History of the Society of Apothecaries*, p. 84.

The apothecaries had their day in 1694 with the passage of the Apothecaries Act. This bill, approved despite the opposition of the College, exempted apothecaries from "serving the Offices of Constable, Scavenger, and other Parish and Ward Offices, and from serving upon Juries," which rights the physicians had long enjoyed.[45] The apothecaries justified their exemption from such obligations on the basis of being a small and valuable minority, "not one in 2,000 people in London," so that they needed full time for their professional duties. Replying to the charge that the service of an apothecary was of doubtful value, they answered, "Our assistance is better than no assistance," referring, no doubt, to the scarcity of licensed physicians, and the usual reluctance of those few to see patients in person.[46]

The climax of a century of feuding came with the establishment by the College of a dispensary where the sick and poor of London could receive free treatment. The need for such free treatment can be seen from John Beller's estimate of 1714 that "There are Twenty Thousand, or more, who Die Yearly, within the Bills of Mortality of *London* and *Westminster* . . . though we have no *Pestilential* Distemper Rages among us. . . ."[47] This was the first such free clinic and is of great importance in medical history.[48]

No action of the College perturbed the apothecaries more than the founding of the dispensary. Their chief complaint was that the physicians intended to prepare their own medicines, setting a precedent which they feared might eventually reduce apothecaries to the status of shopkeepers. A strong minority of College members also opposed the dispensary, but internal opposition gave way after publication of Samuel Garth's famous *The Dispensary; a Poem.* Garth, a Fellow of the College, ridiculed the apothecaries and those physicians who opposed the dispensary scheme. His poem, a popular literary success, describes a mock Homeric battle in which William Harvey was summoned as a referee.[49] In 1701 the apothecaries considered taking legal action

45. *Journals of the House of Lords, 1691–1696*, p. 488.

46. *Journal of the House of Lords, 1693–1695*, n.s., 1693–1714, 10 vols. (London, 1891–1931), 1: 457–58.

47. John Bellers, *An Essay Towards the Improvement of Physick. In Twelve Proposals, By which the LIVES of many Thousands of the Rich, as well as of the Poor, may be SAVED* (London, 1714), p. 2.

48. Shryock, "Public Relations," p. 310.

49. W. W. Francis, et al., eds., *Bibliotheca Osleriana: A Catalogue of Books Illustrating the History of Medicine and Science, Collected, Arranged, and Annotated by Sir William Osler, Bt., and Bequeathed to McGill University* (Oxford: Clarendon Press, 1929), p. 438.

against the dispensary, but demurred after being unable to cite enough evidence of damage to their own interests to indicate a favorable verdict.[50] After 1702 animosity between the two groups died down. In that year in the case of *Rose v. College of Physicians* the apothecaries gained the important right of prescribing medicine and giving medical advice, although they could not charge for the latter. With their rights now clearly and definitely prescribed by law there was less basis for misunderstanding with their rivals.[51]

The College also made several attempts to restrict the privileges of the Company of Barber-Surgeons.[52] This Company had been established in 1540. Its trade was considered low and the Company suffered competition from various groups. In 1605 a new charter strengthened and clarified its rights. This confirmed "their ancient lands and liberties" and stipulated that "no butcher, tailor, etc. [was] to embalm dead bodies, but only chirurgions."[53] Its rivalry with the College is clearly seen in a petition submitted to the House of Commons in 1628.

> The physicians of London have of late obtained a new patent . . . and have therein procured divers grants and privileges, whereby they have power to convert before them any of petitioners society, though not of the Physicians' corporation, or any other loyal subjects within London or seven miles around, and to examine them and their servants of oath, and, being themselves the judges, at their pleasure to fine and imprison them without bail . . . and to convert those finds, which in one year they may raise to 500£, to their own use . . . together with other grants not only to the maiming of petitioners in their profession, but to the great prejudice of subjects in general, and the hindrance of breeding able surgeons to serve . . . in His Majesty's wars.[54]

In 1689 each group appeared before Parliament to argue against bills sponsored by the other. The Surgeons felt their interests threatened by a bill which would have reorganized the College of Physicians. The

50. Albert Rosenberg, "The London Dispensary for the Sick-Poor," *Journal of the History of Medicine and Allied Sciences* 14 (Jan. 1959): 55.

51. O. M. Lloyd, "The Royal College of Physicians of London and some City Livery Companies," *Journal of the History of Medicine and Allied Sciences* 11 (Oct. 1956): 414; *Calendar of the Manuscripts of the House of Lords, 1702–1704*, n.s., vol. 5, Doc. no. 1993.

52. Sidney Young, *The Annals of the Barber-Surgeons of London, Compiled from their Records and other Sources* (London, 1890), pp. 125–26.

53. *C.S.P., D.S., 1603–1610*, p. 189.

54. *C.S.P., D.S., 1625–1649, Addenda*, pp. 316–17.

Surgeons submitted that "their company, after having governed themselves peaceably and without dependence on the College of Physicians, have lately been threatened by them, and a Bill has been brought in to the prejudice of the Petitioners."[55] Concurrently the Surgeons sought approval for "duly approved surgeons to give . . . internal medicines to their chirurgical patients."[56] Such an attempt to change the existing state of affairs must inevitably have met determined opposition from the College. As is usually the case, the extant status emerged trumphant and both bills failed. The College had successfully kept the Surgeons from practicing "internal" medicine, although forced at length to recognize some limited rights in this respect for Apothecaries. Practitioners of both trades, however, were, in the College's "New Statutes of Exclusion," promulgated in 1687, specifically denied affiliation with the physicians. "We appoint and ordain, That no Chirurgion, apothecary, or any such artificer, be admitted into the order of Candidate or Fellow."[57]

Seventeenth-Century Medical Practice

Thus far we have directed attention to the privileges and purpose of the College, its organization, the stratified nature of its membership, and its complicated dealings with two competitors, the Apothecaries and the Barber-Surgeons. But a properly balanced picture of the College must obviously include mention of its general medical role. It is of course a commonplace that this was far from modern in the current meaning of the word. Yet the College and its members made important contributions, and these must be measured by the standards of their own day.

A conspicuous fact about the seventeenth century is the great variety of practitioners. The person who sought professional aid was confronted by various grades of practitioners, all claiming some kind of regular status. These included Fellows, Candidates, Licentiates, Extra-Licentiates, surgeons, barbers, apothecaries, graduates of non-English universities, and even practicing "chymists," who encroached on the apothecaries in the same manner as the latter did on physicians.[58]

55. *The Manuscripts of the House of Lords, 1689–1690*, H.M.C., Twelfth Report, Appendix, Part VI (London, 1889), p. 127.

56. Lloyd, "The Royal College," p. 420.

57. *Statutes*, p. 200.

58. Shryock, "Public Relations," p. 310.

Bickering among these groups made effective mutual cooperation impossible. It is no wonder consequently that professional standards were irregular, improvements were sporadic, and quackery flourished with little interference.

A second striking fact is that none of these practitioners, including the physicians, had any clear conception of the cause of the century's most serious medical problem, namely plague. It was known as an infection but no physician understood the nature of disease, and plague was still considered by many to be a visitation of God. In 1625 David Roth of Ossory, a Catholic Bishop, reported that fewer of his faith than of other faiths were dying from plague. "It is noted by some, at least it is reported by many [wrote Roth], few or no Catholics die amongst so many that are of every side of them carried to their graves. And yet the Protestants, but especially the Puritans, spare not to say that this plague is come from God."[59] In 1636 Sir Robert Harley, a Puritan, wrote, "It is resolved by wiser than the College of Physicians that prayer is the best antidote against the Plague."[60] In 1658 Oliver Cromwell remarked, "we feared God's hand was upon us in an epidemical plague that lay sore on London."[61]

Although the practice of medicine in the seventeenth century was still somewhat restricted by presumed supernatural bonds, such an attitude was discouraged both by the crown and by most physicians. In 1637 Charles I is reported to have said, to his credit, that "some nourish a conceit as if the plague came only by providence and not by infection, and that it is to no purpose to endeavor to prevent it by human means, yet he assures himself that none such are thought worthy to have any place in the government of the city [of London]."[62] By way of prevention his government frequently imposed quarantine on goods and passengers coming from plague-infested countries. On November 1, 1635, for example, there was issued a "Proclamation to restrain the landing of men or goods, out of ships from the parts of France or the low countries now infected with the plague, till they have warrant from the Officers or Farmers of the Customs."[63] This same precaution was observed, as needed, throughout the century.

59. *Report on Franciscan Manuscripts Preserved at the Convent, Merchants' Quay, Dublin*, H.M.C. (Dublin, 1906), p. 80.
60. *C.S.P., D.S., 1636–1637*, p. 175.
61. *C.S.P., D.S., 1658–1659*, p. 82.
62. *C.S.P., D.S., 1637*, pp. 506–7.
63. *C.S.P., D.S., 1635*, p. 458.

The College, for its part, prepared a list of "Annoyances," which suggested, by implication, some positive and practical steps for future action by London officials. Among those listed were "neglect of cleansing of common sewers and town ditches, and permitting standing ponds in divers Inns; uncleanliness of streets; the slaughter houses in the City; . . [and] butchers killing unsound cattle."[64] Charles Mullett has written that the general policy was prevention or restriction; sanitation, segregation, and quarantine were the official remedies.[65]

Despite the incompleteness of such remedies, all are still considered basic in the handling of epidemics. Most other seventeenth-century medical measures, however, as is obvious (without laboring the point) have since proven worthless and sometimes harmful. A few examples will suffice. In 1663, Richard Andrews, physician to the Countess of Newcastle, who was expecting a child, sent her "an eagle stone which in time of labour being tied about the thigh will make the labour easier."[66] Charles II, who was seriously ill in 1684, seemed assured of a favorable prognosis because his physicians "have been so successful in their timely applications by bleeding, cupping, blistering, and all such seasonable remedies and courses, that they now declare him in no danger."[67] And so esteemed were these devices that when Charles died in the following year it was assumed that insufficient bleeding caused his death. "Sir Alexander Fraser his late physician . . . would let blood twice every year at least, and if he omitted or neglected the doing of it that would prove fatal to him. Now, his late Majesty not having let blood the last three years of his life . . . made such a plethora and fulness of spirits that the vessels could not contain them" and consequently "it could not be possible for him to live longer."[68]

Given the ineffectiveness of many medical treatments, one wonders to what extent the physician enjoyed community prestige by mere virtue of his profession. It seems probable that royal physicians and members of the College, the former attendant on the crown, the latter

64. *R.C.P., H.M.C., 8th*, p. 229.

65. Charles F. Mullett, "The Plague of 1603 in England," *Annals of Medical History* n.s. 9 (May 1937): 232.

66. *The Manuscripts of his Grace the Duke of Portland*, H.M.C., 2: 123.

67. *The Manuscripts of His Grace the Duke of Sutherland, Fifth Report of the Royal Commission on Historical Manuscripts*, Part I, Report and Appendix (London, 1874), p. 186.

68. J. R. Clemens, "Notes on English Medicine (Henry VIII–George IV), *Annals of Medical History* n.s. 3 (May 1931): 315.

possessed of extraordinary rights, were certain to be respected. As for the others, unable to bask in reflected glories, and usually practicing in some small town or rural parish, as far from enlightened ideas as from the Censors of the College, the great majority of them must have been ill-trained and insignificant.

Many of these forgotten men had no legal right to practice medicine; some had other trades as well. In 1616 a Mr. Pawlet contracted to do to Virginia as "preacher, physician and surgeon."[69] Such a combination was not unusual. Many assured themselves they could serve both the cross and the caduceus. Noah Biggs, writing in 1651, did not agree. "Some of the *Clergy* also, Priests, and poor Scholars, that have nothing else to do, must now turn Physitians. Some silenc'd ministers and outed of their benefices, Lay hold upon Physic . . . and think their *Latin*, and their *Coat*, the grand *Charter* to entitle them to the practice in Physic."[70]

Most rural and poor city people had no choice but to frequent the irregular and insignificant practitioners. The prominent physicians, including College members, treated "mainly with the Court, the nobility and the rich city merchants."[71] Dr. Theodore T. Mayerne, physician to James I and Charles I, advised his nephew, John Colladon, "never to treat plague patients except from a good distance to windward, lest he lost favour with the *noblesse*."[72] Many of the irregular practitioners were nothing more than quacks. A delightful source of information on quacks is the poetry of John Collop, physician and poet, who wrote at mid-century. Collop, much interested in Harvey's physiological researches, condemned in caustic verses such contemporary medical stand-bys as phlebotomies, purges, fontanels, defluxations, and the theory of humours. His titles include "On the Humours," "To a Piss-Pot Prophet," "The Sequestered Priest pidling in Physic," and "On Suburban non-licentiates, *who Fox-like call the Colledge grapes sour*."[73]

Medical science in Collop's time was still dominated by the writings of Galen, Hippocrates, and the Arabs. Candidates of the College were

69. "The Manuscripts of Reginald Cholomondeley, Esq.," *Fifth Report of the Royal Commission on Historical Manuscripts*, Part I, Report and Appendix (London, 1874), p. 341.

70. Conrad Hilberry, "John Collop's Medical Poems," *Journal of the History of Medicine and Allied Sciences* 9 (Oct. 1956): 403.

71. F. N. L. Poynter and W. J. Bishop, *A Seventeenth Century Doctor and His Patients: John Symcotts, 1592?–1662, The Publications of the Bedfordshire Record Society*, vol. 31 (Streatley, Near Luton, Bedfordshire: The Bedfordshire Record Society, 1951), p. xviii.

72. Francis, *Bibliotheca Osleriana*, p. 679.

73. Hilberry, "John Collop."

still required to read "within a year the five first Books of Galen concerning Simple Medicine, and all the Books of the use of the parts."[74] The physician was more of a philosopher than a clinician, and medical education reflected this fact. Neither Oxford nor Cambridge offered much instruction in strictly medical subjects. Students did no dissection, and since there were no hospitals at Oxford or Cambridge, there was no opportunity for clinical instruction.[75]

Concluding Remarks

The preceding sketch has suggested some attributes of seventeenth-century medicine. Reference has been made to irregular practitioners such as priest-physicians and quacks, to the confusion of medicine with theology, to the reverence for traditional authority, and to impractical medical education. Information on these aspects offers a basis for understanding the improvements that occurred, since these were rarely dramatic and hence are apt to be deemed less consequential when discussed outside the context of their times.

In this essay we have been concerned only with the changes in medical practice which were related to the Royal College of Physicians. The work of other important institutions, such as the dissenting academies, Gresham College, and the Royal Society, is not included. The contributions of the College can be divided into those made collectively by the group and those made by individual members, but sharp distinctions cannot always be made between these two categories.

In the seventeenth century the Royal College of Physicians was the greatest institution on London for postgraduate medical study.[76] Two special lectureships were held annually for the benefit of members. The Lumleian surgical lectures were authorized as early as 1582 and William Harvey conducted them from 1616 to 1656. All Fellows and Candidates, upon admission, were required to promise to attend these lectures for five years, and to perform one dissection if requested to do so by the President. "Unlike the university lectureships, those of the College of Physicians were of a very high quality throughout the century."[77]

74. *Statutes*, p. 95.

75. Phyllis Allen, "Medical Education in Seventeenth Century England," *Journal of the History of Medicine and Allied Sciences* 1 (Jan. 1946): 120–21.

76. Ibid., p. 136.

77. Ibid., p. 139.

A very important collective contribution was the publication, in 1618, of the first edition of the *Pharmacopoeia Londinensis*, which was the first standardized, official guide to the preparation of medicines. All apothecaries were required to follow it. Far more than a compendium, it was a combination formulary and textbook. Its inclusion of chemical remedies, only recently advocated by Paracelsus, indicates the "unusually modern and broad views that must have prevailed among the members of the Royal College of Physicians at the end of the sixteenth century."[78] Followers of Galen denounced the chemical cures as worthless, but his influence obviously was waning in the College.

Charles Gillispie demonstrates the important role played by the College of Physicians in founding the Royal Society. He first proves the extremely wide-ranging scientific interests of College members during the years 1603–1625, which included such pursuits as astronomy, chemistry, physics, and botany. Somewhat later, during the interregnum, ten of the twenty-five most outstanding scientific leaders of the time were, or soon became, Fellows of the College. Gillispie concludes that "there seems to be tolerably complete statistical evidence of the London medical profession's vital contribution to the foundation of the Royal Society and to the deepening of scientific curiosity which produced it."[79] The Royal Society did much to propagate new ideas in medicine. Until the eighteenth century its *Philosophical Transactions* was the only periodical in England in which medical papers could appear.[80]

Another great advance was that of the dispensary, founded in 1696. This set a precedent for many free clinics which were organized later in the American colonies and in Great Britain. It was conceived partly from selfish motives—circumventing the apothecaries—but it brought proper medical care for the first time to many indigent people. It shows, as well, a departure from the privilege-seeking orientation of the medical profession towards renewed and formal acceptance of its humanitarian and social obligations.[81]

78. College of Physicians of London, *Pharmacopoeia Londinensis* (1618; reproduced in facsimile, intro. by George Urdang, Madison: State Historical Society of Wisconsin, 1944), p. 16.

79. Charles C. Gillispie, "Physick and Philosophy: A Study of the Influence of the College of Physicians of London upon the Foundation of the Royal Society," *Journal of Modern History* 19 (Sept. 1947): 217.

80. Humphrey Rolleston, "Medical Friendships, Clubs and Societies," *Annals of Medical History*, n.s. 2 (May 1930): 258.

81. Rosenberg, "The London Dispensary," pp. 50–56.

Individually the greatest advance came, of course, from William Harvey, whose discovery of the circulation of the blood greatly advanced the science of experimental physiology and laid the basis for modern medicine. This famous development needs no elaboration here.

The first modern study, both clinical and anatomical, of any single disease, was made by a team of nine physicians of the Royal College. One of these men, Dr. Francis Glisson, published their findings on rickets in his volume *De Rachitide*. This early example of medical teamwork anticipates the collective efforts of modern research teams.[82]

The first great clinician of the College was not Glisson but Thomas Sydenham, a Licentiate. Sydenham based his opinion on direct observation. In his extensive writings he rarely cited either Galen or his own contemporaries. This objective experiential attitude led him to make great advances in understanding the nature of disease. He concluded that each disease possessed a special nature of its own and was not merely a generalized irregularity in natural function. His useful studies of bubonic plague, typhoid fever, gout, malaria, and cholera are modern in spirit and can be regarded as precursive to Pasteur and the modern science of bacteriology.

Dr. Thomas Willis, a Fellow of the College, investigated the anatomy of the brain and nervous system[83] with fully acknowledged help from Dr. Richard Lower, the physiologist whose studies explained part of the action of the cardiovascular system.[84] Dr. Richard Morton contributed a classic study of tuberculosis. Sir Thomas Browne, author of *Religio Medici*, and a Fellow of the College, did no important research but was an enthusiastic advocate of the new experimental approach to science and learning. Dr. Jonathan Goddard converted his London home into a laboratory, which was made freely available to College members.

The Royal College of Physicians of London is an institution of unusual interest to historians. It provides not only the stimulating example of certain creative individuals, whose influence is clearly seen, but also that of a corporate, strongly organized institution, whose

82. Rolleston, "Medical Friendships, Clubs and Societies," p. 259.

83. R. McNair Wilson, *British Medicine* (London, [n.d.]), p. 14.

84. Richard S. Westfall, *Science and Religion in Seventeenth-Century England*, ed. David Horne (New Haven: Yale Historical Publications, 1958), p. 17.

collective contribution, less readily defined, is also significant. Approached internally, as an institutional study, the College reflects the status-conscious, privilege-seeking society so typical of the period. Studied externally it provides clear evidence of a growing sense of confidence and professionalism within the medical community, which, armed with improving scientific knowledge and equipment, reached out more readily to all classes of society, including the sick-poor of London as well as the more affluent classes. Thus on both scientific and humanitarian grounds the College provides a valuable point for plotting movement toward modern times.

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Erratum

In the June 1983 issue of *Transactions & Studies of the College of Physicians of Philadelphia* (Series V, Volume V, No. 2), the name of the author of excerpts entitled "American Manners, Customs, and Conditions in 1841" (p. 108) and "Alligators in Georgia" (p. 122) was inadvertently misspelled. The correct name of the author is Charles Lyell.

Dr. William Darlington's Botanical Contacts on the Western American Frontier*

RONALD L. STUCKEY

TWO HUNDRED years after the birth of Dr. William Darlington (1782–1863), we have returned to the county of his birth and to the cradle of American botany. Here in the fertile picturesque countryside of southeastern Pennsylvania, several pioneer nineteenth century botanists were born and conducted their botanical work. Among them were John Bartram and his son William of Philadelphia, Humphrey Marshall of Marshallton, William Baldwin of Downingtown, William Darlington of West Chester, and Darlington's co-workers David Townsend and Josiah Hoopes. Today our focus is William Darlington. Several biographers have sketched his accomplishments, namely Washington Townsend (1863),[1] Asa Gray (1863),[2] and Thomas P. James (1869).[3] All these appreciations were written soon after Darlington's death. Later were those by John W. Harshberger in his *Botanists of Philadelphia* (1899),[4] by Howard A. Kelly in his *Some American Medical Botanists* (1914),[5] and by William T. Sharpless (1932)[6] in a sketch written for the sesquicentennial celebration of Darlington's birth. In more recent years, interest in

1. W[ashington] T[ownsend], *Memorial of William Darlington, M.D. Born April 28th, 1782, Died April 1863*, (West Chester, Pa.: 1863). Three hundred reprinted copies were issued on April 28, 1892, for the dedication of the William Darlington Special Collections Room, Francis Green Library, West Chester State College, West Chester, Pennsylvania.

2. A[sa] G[ray], "The Late Wm. Darlington," *American Journal of Science* 86 (1863): 132–39.

3. Thomas P. James, "An obituary notice of Dr. William Darlington," *Proceedings of the American Philosophical Society* 9 (1865): 330–42.

4. John W. Harshberger, *The Botanists of Philadelphia and Their Work* (Philadelphia, 1899), pp. 134–43.

5. Howard A. Kelly, "William Darlington 1782–1863," *Some American Medical Botanists Commemorated in our Botanical Nomenclature* (1914; reprint ed., New York: D. Appleton, 1929), pp. 113–17.

6. William T. Sharpless, "Dr William Darlington, Physician and Botanist," *Bartonia* 14 (1932): 1–13.

*Presented at the "William Darlington Bicentennial Observance" held at West Chester State College, West Chester, Pennsylvania, on April 25–28, 1982.

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Darlington's life and botanical work have regenerated. The late Dr. Robert B. Gordon of the Science Department at West Chester State College described Darlington's herbarium and listed its contributors.[7] In 1965, the Chester County Medical Society held a commemoration of Darlington which included contributions by Drs. Dorothy I. Lansing[8] and William R. Overlease.[9] Subsequently Dr. Lansing studied Darlington's life in great detail,[10] and prepared an extensive unpublished manuscript biography.[11] I have been in contact with Drs. Lansing, Overlease, and Gordon and have learned from them much about Darlington's life and work, and thank them for their help.

My interest in Darlington is limited to botanical aspects. However, during twenty years of research in the history of nineteenth century eastern North American botany, I have paid little attention to Darlington (Fig. 1), because my study was directed primarily toward pioneer botanists of the Ohio valley, which was the western frontier of our country during the first half of the nineteenth century. In establishing an herbarium of dried pressed plants as part of the Chester County Cabinet of Natural Science, Darlington sought not only local plants but also plants from all parts of the country, in order to acquire complete knowledge of the botany of the United States. One of the most economical means of developing an herbarium is by exchange of specimens among friends of botanical science in various parts of the country. His ideas, of course, have been more than realized—and even to a greater extent than he would have envisioned—with the establishment of many institutional herbaria as this country expanded across the continent in the nineteenth and early twentieth centuries. Darlington exchanged correspondence and dried botanical specimens with interested persons in this country and abroad. My efforts today will center on those with whom Darlington corresponded on the western frontier, especially in the Ohio valley.

7. Robert B. Gordon, "The 'Darlington Herbarium' at West Chester," *Bartonia* 22 (1943): 6–9.

8. Dorothy I. Lansing, "William Darlington, M.D.—Our Founder: A half-forgotten man of science," *William Darlington, M.D.,* (West Chester, Pa.: Frazer Press, 1965), pp. 20–22.

9. William R. Overlease, "Dr. William Darlington as a Botanist," *Torch Bulletin of West Chester State College* 94 (1966): 6–12.

10. Dorothy I. Lansing, "The Life and Accomplishments of Doctor William Darlington (1782–1863). Report on research grant," *American Philosophical Society Year Book* 1969: 595–97.

11. Dorothy I. Lansing, "Books, Botany, and Tombstones, The Story of Dr. William Darlington, 1782–1863," unpublished typescript.

Figure 1. Dr. William Darlington. (From Dorothy I. Lansing, *William Darlington, M.D.*, West Chester, Pa.: Frazer Press, 1965, by permission.)

Darlington's Western Correspondents

Several of Darlington's earliest western correspondents were identified in a letter[12] that he sent on April 18,1831 to the Rev. Lewis David von Schweinitz (1780–1834), a Moravian minister and avid botanist, who was living in Bethlehem, Pennsylvania.[13] Schweinitz, educated in America and Europe, was the proprietor of the Moravian Church Estates in the northern states and senior pastor at Bethlehem. Even more than a devoted pastor and dedicated administrator of the church, he was America's foremost botanist at that time. In four major publications he named and described as new to science about 1400 species of fungi and contributed significantly to knowledge of flowering plants. He was among the first in North America to publish monographic treatments of two very difficult genera, *Viola* (violets) and *Carex* (sedges), and the first person to prepare analytical tables, or nearly dichotomous keys, to vascular plants. He named and described 55 species of vascular plants as new to science. He prepared local floras and left an unpublished 357-page manuscript, *Synopsis Plantarum Americanum*, which contains the names, descriptions, and habitat notes on the known flowering plants and ferns of the continent. He wrote also on the invasion of foreign plants into North America, and he left to the Academy of Natural Sciences of Philadelphia, where it remains today, an herbarium containing about 23,000 species of vascular plants.[14]

Schweinitz was one of Darlington's earliest correspondents on botanical concerns. He sought Schweinitz's assistance while preparing

12. Wm. Darlington to Lewis David von Schweinitz, April 18, 1831, Manuscript Collection No. 438, Letter No. 63, Library, Academy of Natural Sciences of Philadelphia.

13. Walter R. Johnson, *A Memoir of the Late Lewis David von Schwenitz, P.D. with a Sketch of his Scientific Labours* (Philadelphia: The Academy of Natural Sciences, 1835); Donald P. Rogers, "L. D. de Schweinitz and early American mycology," *Mycologia* 69 (1977): 223–45; [W. J. Youmans] "Sketch of L. D. von Schweinitz" *Popular Science Monthly* 44 (1894): 833–40. Reissued in *Pioneers of Science in America: Sketches of Their Lives and Scientific Work* (1896; reprint ed, New York: Anro Press, 1978), pp. 167–75.

14. F. W. Pennell, "The botanist Schweinitz and his herbarium" *Bartonia* 16 (1935): 1–8; Ronald L. Stuckey, "Type specimens of flowering plants from eastern North America in the herbarium of Lewis David von Schweinitz" *Proceedings of the Academy of Natural Sciences of Philadelphia* 131 (1979): 9–51.

his first botanical book, *Florula Cestrica*(1826),[15] a catalogue of plants which contained notations on abundance and occurrence in and near the borough of West Chester. In appreciation of Schweinitz's help, Darlington dedicated this book to him. Their close botanical friendship continued. In the spring of 1831, when Schweinitz was planning a trip into western Pennsylvania, eastern Ohio, and southern Indiana, to conduct business for the Moravian Church, he asked Darlington for letters of introduction to knowledgeable acquaintances on the western frontier. He hoped these persons could supply him with botanical information and specimens. On April 14, 1831, a short time before he was to make a pilgrimage to southern Indiana for the dedication of a new Moravian Church at Goshen, now Hope, in Bartholomew County, Schweinitz wrote to Darlington:

> Permit me to add a request. For the replenishment of my health, I am about undertaking a journey of some length to the Westward as far as Indiana—about the middle of May. If it is agreeable to do so, you would confer a great favor on me, by furnishing me with a letter of introduction to litterary [sic] gentlemen at Pittsburg or along the Ohio, with whom you may be acquainted or even to other gentlemen at Pittsburg whose acquaintance you might think interesting to me. If you can be so kind, I would thank you to forward your letters to Bethlehem—as I shall leave here by Friday. . . .[16]

Before relating Darlington's reply, we should note that Schweinitz did indeed undertake the journey, and in his customary fashion recorded the plants he saw en route, collected specimens, and exchanged botanical information. His narrative of the journey was translated from the German and published in 1927 by Adolf Gerber;[17] and his list of plants, totaling 1075 numbered names accompanied by brief notations on localities and habitats, remains in holograph manuscript in the New

15. Wm. Darlington, *Florula Cestrica: An Essay Towards A Catalogue of the Phaenogamous Plants, Native and Naturalized, Growing in the vicinity of the Borough of West-Chester, in Chester County, Pennsylvania: With Brief Notice of their Properties, and Uses, in Medicine, Rural Economy, and the Arts. To which is Subjoined and Appendix of the Useful Cultivated Plants of the same District.* (West Chester, Pa.: Simeon Siegfried, 1826).

16. Lewis D[avid von] Schweinitz to William Darlington, April 14, 1831, William Darlington Papers, vol. 8, letter no. 21, Library, The New-York Historical Society, New York (hereafter cited as Darlington Papers, New York).

17. Adolf Gerber, trans., "The journey of Lewis David von Schweinitz to Goshen, Bartholomew County, in 1831," *Indiana Historical Society Publication* 8 (1927): 205–85.

York Botanical Garden.[18] In his reply of April 18, 1831 to the letter just mentioned, Darlington sent Schweinitz letters of introduction to five persons and wrote:

> I am much concerned to hear that your health has been so much affected, during the late winter; but hope your contemplated excursions to the West may fully re-establish it. I have written three or four letters, agreably to your request, for the purpose of introducing you to the acquaintance of some of my friends in that quarter. They are herewith enclosed. I have not the good fortune to be acquainted with the literary gentlemen of Pittsburgh; but I have sent a letter to a cousin of mine there, (Mr. Benj^{n} [Benjamin] Darlington) who is a thrifty, hospitable gentleman, and will, I am confident take pleasure in making you acquainted with such as he may happen to know, & will, moreover, I think, afford in his proper person a favorable sample of hospitality of the City. I have enclosed a letter to Dr. Price & Dr. Drake, of Cincinnati. The latter gentleman, probably, you may be already acquainted with. If so, my letter will be in some measure superfluous; if not, I think you will be pleased with his acquaintance. Dr. Price went from this neighborhood, and is a gentleman of good family & education. Mr. Hendricks, of Indiana is I believe, the only gentleman in that state, that I am acquainted with. Perhaps you may know him; as he was in Congress, at the time you were in Washington City, in 1822–3. I do not know whether you contemplate going into the state of Kentucky: But if you do, I would like you to visit *Lexington.* There is a gentleman there (Dr. C. W. Short), who would be extremely happy of your acquaintance. I would send you a Letter to him, if I thought you would go there; but it is scarcely necessary, either—for all you would have to do, would be to call on him & mention your name, to ensure a most cordial reception. I know he is anxious to have the benefit of your acquaintance; & as the excursion through that country might be useful to you, as well as interesting. I hope you may be able to take Lexington in your way.
>
> I trust your health & strength may so improve, as to enable you to *Botanize* with success, in that distant region, at the approaching interesting season; and should you be provided with the means of preserving specimens of new or rare plants, I hope you will lay by one extra specimen of each, for our Cabinet. You see I cannot help being selfish, on the occasion. But so it is—the more we get, the more we want. At all events, I hope you may be favored with a pleasant journey, and a happy return to your family and friends. . . .

18. [Lewis David von Schweinitz], "List of all the plants observed by Lewis De Schweinitz on a journey thro Delaware, Maryland, part of Virginia, Indiana, Ohio & Pennsylvania from 13th May to the 21st July 1831," Holograph manuscript, Library, the New York Botanical Garden, Bronx, New York.

Daniel Drake

Of the persons mentioned in the letter, only Dr. Daniel Drake and Dr. Charles W. Short require further discussion. It is not known how Darlington came to know Drake (1785–1852), the pioneer physician of Cincinnati, who, by organizing and founding colleges, hospitals, clinics, libraries, and literary, scientific, and professional societies, gained recognition as that city's foremost citizen. The two men probably met through Dr. Benjamin Smith Barton, Professor of Materia Medica, Natural History, and Botany in the University of Pennsylvania. Darlington had attended the University of Pennsylvania in the winters of 1802–03 and 1803–04 and had received the degree of Doctor of Medicine in June 1804. During the second year he had attended Barton's botanical lectures. Drake did not arrive to study medicine at the University of Pennsylvania until 1805–06; he returned in 1815–16 and received the M.D. degree in May 1816. Their years in medical school do not coincide, and no meetings of the two young medical students are known. Perhaps Darlington met Drake when the former visited Barton in Philadelphia.

Born in New Jersey, Drake spent his boyhood in Mayslick, Kentucky.[19] At the age of 15 he was taken to Cincinnati to study medicine under Dr. William Goforth. Establishing himself in Cincinnati, Drake later taught materia medica, botany, anatomy and physiology, theory and practice of medicine, clinical medicine, and pathological anatomy. Greatly interested in the natural sciences, especially botany, he was the first resident of the West to provide botanical information in books published west of the Allegheny Mountains. In his first essay, *Notices Concerning Cincinnati* (1810),[20] Drake outlined the phenological progress, or flowering times, of selected plants in the Cincinnati neighborhood during the spring of 1809. In the appendix he described the Columbo Root, *Frasera carolinensis*, and included notes on its habitat, phenology, and medicinal properties. In his second book, *Natural and Statistical*

19. Otto Juettner, *Daniel Drake and His Followers: Historical and Biographical Sketches* (Cincinnati: Harvey, 1909); Henry D. Shapiro and Zane L. Miller, eds. *Physician to the West: Selected Writings of Daniel Drake on Science & Society* (Lexington: The University Press of Kentucky, 1970).

20. Daniel Drake, *Notices Concerning Cincinnati* (1810; reprinted in Shapiro and Miller, eds., *Physician to the West*), pp. 5–56.

View, or *Picture of Cincinnati, and the Miami Country* . . . (1816),[21] Drake 1) listed the native trees of Miami County (61 genera and 102 species), 2) reviewed the characteristics of two species of buckeye, one of which he considered new to science and described under the name *Aesculus maxima*, 3) listed 66 plants useful in medicine and the arts, noticing the part of the plant to be used and the medical property that each plant possessed, and 4) provided a floral calendar that recorded the phenological progress of selected plants in the Cincinnati neighborhood. In 1818, Drake was the first to give public lectures on botany west of the Allegheny Mountains;[22] these lectures he and his followers continued at various intervals with great success in subsequent years. In 1829, Drake published his third botanical innovation for the western country; this was his guide for the collection of plants and preparation of herbarium specimens by young medical students.[23] Drake's greatest contribution to botany was his promotion of the subject; this he accomplished not only by the achievements already mentioned, but also by reviewing publications on the flora of eastern North America, by urging the writing of local and regional floras of the Mississippi valley, and by pointing out the necessity for young physicians to study the specialized sciences, especially botany. He argued for the creation of additional professorships in natural history and botany in medical schools.[24]

Charles Wilkins Short

Through the correspondence with Drake, Darlington learned about Dr. Charles Wilkins Short (1794–1863) of Lexington, Kentucky (Fig. 2). As a scientist, Short is best known for his pioneer floristic studies of

21. Daniel Drake, *Natural and Statistical View, or Picture of Cincinnati and the Miami Country, illustrated by maps* (Cincinnati: Looker and Wallace, 1816).

22. Emmet Field Horine, *Daniel Drake (1785–1852): Pioneer Physician of the Midwest* (Philadelphia: University of Pennsylvania Press, 1961), p. 153.

23. [Daniel Drake], "Reviews and bibliographical notices," *Western Journal of Medical and Physical Sciences* 2 (1829): 183–208. See pp. 207–8 concerning procedures for making an herbarium.

24. Ronald L. Stuckey, "Medical botany in the Ohio valley (1800–1850)," *Transactions & Studies of the College of Physicians of Philadelphia* ser. 4, 45 (1978):264–66.

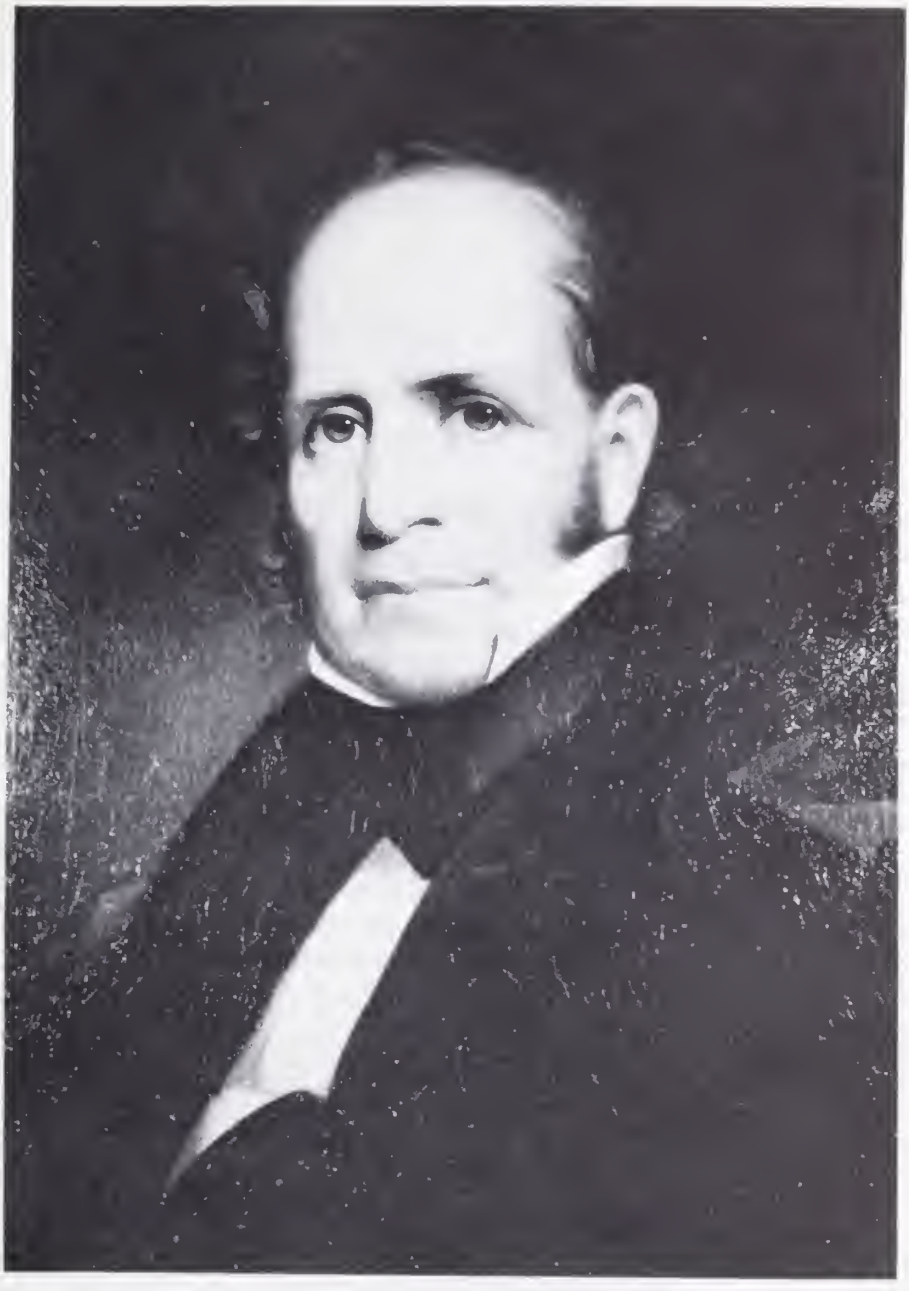

Figure 2. Dr. Charles Wilkins Short, from a portrait painted by J. R. Lambdin (ca. 1834) in Lexington, Ky. The original painting is owned by Dr. Thomas A. Courtenay, Shelbyville, Kentucky; print is reproduced from a color slide photographed by Dr. Eugene H. Conner.

Kentucky and for the well-prepared plant collections that he distributed to botanists throughout the world.[25] A quiet, calm, modest, and dignified gentleman, he was an industrious botanist. Through his teaching and writing, and through his correspondence with more than 75 botanists, he promoted botany effectively. Born at Greenfield in Woodford County, Kentucky, he was educated at a private school and at Transylvania University before entering the University of Pennsylvania, where he obtained the degree of Doctor of Medicine in 1815. Like Darlington and Drake, Short was strongly influenced in botany by Benjamin Smith Barton. Short and his fellow students took numerous botanical excursions with Barton to the banks of the Schuylkill River, to Bartram's Garden, and to the New Jersey shore.

Upon graduation Short accepted the chair of materia medica and medical botany at Transylvania University, but before commencing work he declined the position and declined it a second time two years later. He began to practice medicine in Lexington, Kentucky, in 1816, but in the spring of 1817 he removed to Hopkinsville in the barrens of western Kentucky, where he practiced for eight years. During these early years of his medical activity Short found time to study the flora of the countryside and he began to correspond with several botanists. During the next two decades this brought him to the forefront of botanical development in the Ohio valley. In 1825 Short again accepted the chair of materia medica and medical botany at Transylvania University. Here he taught until 1837 and served as dean from 1828 to 1837. He then relocated to the newly organized Louisville Medical Institute where he also taught and served as dean. In 1849 he became Emeritus Professor of Materia Medica and Medical Botany. He then retired to Hayfield, a beautiful 230-acre country estate five miles south of Louisville, where he lived the remainder of his life.

The known correspondence between Darlington and Short began in 1827 and continued until 1859. It consists of 26 letters by Darlington

25. Irving Frederick Ahlquist, "Ohio Valley Culture as Reflected in the Short Family, 1700–1860" (Ph.D. dissertation, University of Illinois, Urbana, 1947); P. Albert Davies, "Charles Wilkins Short, 1794–1863: Botanist and physician," *Filson Club History Quarterley* 19 (1945): 131–51, 208–49; S. D. Gross, "Obituary of Charles Wilkins Short, M.D.," *Proceedings of the American Philosophical Society* 19 (1865): 171–86; Ronald L. Stuckey, *Scientific Publications of Charles Wilkins Short* (New York: Arno Press, 1978) pp. i–vii.

(16 known extant)[26] and 29 by Short (all extant).[27] In the first letter, dated June 4, 1827, Darlington enclosed an announcement which stated the objectives and goals of the Chester County Cabinet of Natural Science. Also enclosed was a list of plants alleged to grow in the western country. It was stated that dried specimens of these would be acceptable to the Society for the Herbarium, then in its early stages. Darlington also explained:

> I have been led to address you, in consequence of being informed by Doctor Drake, of Cincinnati, that you were partial to Botanical pursuits; and hope you will excuse the freedom I have used. Dr. Drake was so polite as to undertake to forward to you a copy of a *Catalogue* of the Plants of this vicinity [*Florua Cestrica*, 1826], which I published last year—and I trust you have received, ere this. If there should be any plants enumerated in the Catalogue of which you would like to receive Specimens, it will give me pleasure, on you designating them, to collect and forward them to you, in such manner as you may suggest.

In his reply, dated September 10, 1927, Short acknowledged receipt of the *Florula Cestrica* sent from Cincinnati by Drake. He continued the letter by saying that he was laying aside dried plants that he thought might be acceptable to the Society. In subsequent years the two men exchanged many letters and specimens. In his letter of January 18, 1832, Darlington emphasized the importance of exchanging plants:

> There is nothing more delightful to a true Botanist,—& scarcely any thing better calculated to facilitate the knowledge of Plants, —than a free & liberal interchange of specimens, remarks, & opinions.

Even though botanical exchanges and comments on specimens dominated much of the correspondence, these important aspects will not be given further attention in the present essay. Instead, I shall turn to projects of interest to the two botanists.

26. Wm. Darlington to Charles Wilkins Short, 14 letters from June 4, 1827 to March 1, 1841, in "Botanical correspondence, or letters addressed to C.W. Short. . ." vols. 1 and 3, Charles W. Short Manuscript Collection, Library, The Filson Club, Louisville, Kentucky; Wm. Darlington to Charles Wilkins Short, September 12, 1849 and July 13, 1859, in W. C. Coker, ed., "Letters from the Collection of Dr. Charles Wilkins Short," *Journal of the Elisha Mitchell Scientific Society* 57 (1941): 98–168.

27. C. W. Short to Wm. Darlington, 28 letters from September 10, 1827 to July 5, 1859, Darlington Papers, vol. 1, letter nos. 485, 489; vol. 8, letter nos. 135–180; vol. 10, letter nos. 156–157, 162, New York; C. W. Short to Wm. Darlington, April 6, 1856, Conarroe Papers, vol. 7, p. 84, Library, Historical Society of Pennsylvania, Philadelphia.

A Contemplated Expedition

In a postscript to his first letter to Short, Darlington mentioned his desire to receive specimens and ripe seeds of *Acacia brachyloba* and *A. glandulosa,* members of the legume or bean family. These plants were of special interest to Darlington, because A. P. DeCandolle,[28] the famous Swiss botanist, had recently separated these species from *Acacia*, placing them in a new genus which he named *Darlingtonia* (Fig. 3). Darlington

Figure 3. Darlingtonia brachyloba. (From A. P. DeCandolle, *Mémoires sur la famille Des Légumineuses*, Paris: Chex A. Belin, 1826, pl. 66. Print is supplied by Dr. and Mrs. James A. Mears, The Academy of Natural Sciences, Philadelphia.)

28. [A. P.] DeCandolle, "Notice sur quelques genres et espèces nouvelles de legumineuses, extraite de divers Mémoires présentés à la Société d'Histoire naturella de Genéve, pendant le cours des annés 1823 et 1824," *Annales des Sciences Naturelles* (Paris) 4 (1825): 90–103.

noted modestly that it was "an honor which I fear I did not fully merit; but which, nevertheless, makes me desirous to possess the plants." In the *Flora Boreali-Americana* (1803),[29] André Michaux, the French botanist, had originally described these species in the genus *Mimosa* and had noted that the *Mimosa illinoensis* (*A. brachyloba*) grew in the wet prairies of Illinois, while *M. glandulosa* occurred along the Tennessee River. Darlington suggested to Short that perhaps these species might be found in Kentucky and implied that Short should try to find them. In his first letter to Darlington, Short regretted his inability to supply information about the two species of *Darlingtonia*; he had never visited the "Prairies of Illinois" where Michaux had botanized, but he believed that the "Barrens" of Kentucky, where he had resided and had made limited studies, had a similar flora. Doubtless this request for particular species made Short think about trying to find them. In his second letter, dated January 15, 1829, Short proposed a botanical collecting expedition to the prairies:

> I have it seriously in contemplation to make an excursion during the approaching spring to some of the unexplored districts of our western states—the remoter parts of Arkansas—Missouri or Michigan for instance. How would it comport with your inclination or engagements to go along? We could, by steamboat, penetrate into the remote settlement of Missouri or Arkansas, and from such point proceed on foot or horseback to the uninhabited wilds of these countries, where we should find nature in undisturbed profusion of the soil. We could also, in passing, pay our compliments to those distinguished naturalists, McClure, Say, and Lesueur, who seem to buried themselves alive in their Utopian settlement at Harmony.[30]
>
> I shall be prepared to set out on this expedition about the first of April; let me know your mind on the subject, for I should be delighted to have your company, and I think you would be rewarded for the labour of the undertaking; in the rich harvest of discovery you might make in our untrodden wilds.

29. André Michaux, *Flora Boreali-Americana* (1803; reprint ed., New York: Hafner Press, 1974).

30. Donald E. Pitzer and Josephine M. Elliott, "New Harmony's first Utopians, 1814–1824," *Indiana Magazine of History* 75 (1979): 225–300.

On February 28, 1829, Darlington replied:

> It would, indeed, be gratifying to me, to be able to accompany you in your contemplated excursion; but my engagements are such that I cannot even find time to explore the interesting regions of my own state. I hope, however, that you will prosecute your intended expedition, & collect everything that falls in your way. I should be happy to hear the result, on your return; and, if it were not too much to ask, to participate in some of the Botanical Treasures, which you can hardly fail to collect.

Short must have discovered that such an extensive expedition was more than he could manage. On May 12, 1829, he wrote:

> In relation to my contemplated tour to Missouri, I find it is not so easy a matter, even to commence it, as I had hoped, and it more than probable I shall be compelled to abandon it, at least for the present season: . . . I am very far from being acquainted with all the vegetable productions of my immediate neighbourhood, which I wish to make the object of my more particular research.

Short began to take trips to the Kentucky River, a distance of fifteen to twenty miles, and to other localities ten to fifteen miles from Lexington. Soon he recognized that he had many plants yet to learn in the state of Kentucky. Darlington continued to show interest in these expeditions, as he noted in a letter of March 5, 1832. He was pleased to learn of Short's "laudable intention of herborizing" among the mountains and prairies during the approaching season. Then he said:

> How much pleasure it would give me, to join you on such an excursion! But, alas, I find myself so much trammelled by domestic engagements, & duties, that I can never hope to visit the interesting regions of the West.

In subsequent letters Short continued to speak of contemplated botanical expeditions to Lake Erie and the Cumberland Mountains (March 6, 1833), the prairies of Ohio and Indiana, the shores of Lake Erie and Lake Michigan, and a return to the barrens of Kentucky (March 3, 1834). On July 10, 1835, Short wrote that he could not go to Illinois, but he was able to explore in the barrens of Kentucky, as he detailed in a letter of December 28, 1835. On June 23, 1836, Short wrote: "I have been again failed in my expectation of visiting . . . [Illinois], the prairies of which must certainly afford a rich field for the botanist."

The opportunity for Short to see the prairies finally came, late in the summer of 1837. With his son William, his brother John Cleves Short, and a Dr. Winter of Lexington, Charles W. Short took a six-week tour through Indiana and Illinois to satisfy his curiosity about its plant life and to invest in public lands. On October 17, 1837 he wrote to Darlington:

> Botanically speaking my expectations were not fully realized; for although the sight of a large prairie is to one unused to it a magnificent spectacle, and to the florist almost enchantment; yet the charm results rather from the profuse abundance of a few flowering plants, than from their variety. In some points of view hundreds, yea thousands of acres reflected a purplish tint from the myriads of *Liatris*, . . . with which the prairie was strewed; and in other places a carpet of golden yellow as extended as far as the eye could reach; of *Silphiums*, *Helianthi*, *Coreopsis* &c—Indeed, where any one plant gains ascendency, from any cause whatever, it seems to lord it over an extent of territory, to the exclusion of almost every thing else . . . I looked in vain on the borders of the Illinois river for the *Darlingtonia*; for I should have been much delighted at meeting, so far from home, with an old friend.

In February 1845, Short sent to his friend Dr. Drake a much more detailed description of his observations on the autumn flora of the Illinois prairies. Drake published the communication in the March 1845 issue of the *Western Journal of Medicine and Surgery*.[31] Short attempted no further botanical expeditions into western regions and consequently did not find the two species of *Darlingtonia*. In the meantime, however, Darlington had obtained specimens of the plant originally known as *Mimosa illinoensis* from John Bartram's botanical garden in Philadelphia.[32] Today, this species is known under the name *Desmanthus illinoensis*.

Ideas for Publication

Short had big plans for botanical publications, but he needed help from the established botanists in the centers of economic and cultural activity on the east coast. On May 12, 1829 he wrote to Darlington, urging him to interest Schweinitz in the republication of his monograph of *Viola* as a separate item, accompanied by colored engravings of the

31. C. W. Short, "Observations on the botany of Illinois, more expecially in reference to the autumnal flora of the prairies," *Western Journal of Medicine & Surgery* 3 (1845): 185–98 (reprinted in Stuckey, *Scientific Publications*).
32. Wm. Darlington to Amos Eaton, February 7, 1829, in "An unpublished letter of Wm. Darlington," *Bulletin of the Torrey Botanical Club* 8 (1881): 142–44.

plants. Short, who admitted having some latent talent in botanical illustration, offered his service in drawing western species of violets. Then he asked Darlington:

> Is there not enough of taste, wealth and industry among the Botanists of America to conduce and sustain a periodical publication after the manner of Curtis Bot. Mag. in which all the known plants of our country might be described and accurately delineated? . . . The large octavo would be decidedly the best form. Such a work if ably executed, would be eagerly sought after, and liberally patronized by the European litterature [sic].

In a letter of December 26, 1831, Short resurrected the idea of a periodical publication in the United States on the plan of Curtis' Botanical Magazine. He described the contemplated work as:

> devoted exclusively to the indigenous botany of the country, containing in imperial octavo, faithful and well-executed, coloured engravings, of all Amer. plants, with a page or two of descriptive letter press . . . Would not Nuttall undertake to publish such a work? He would be the ablest person at description, comparison &[c] and in Boston, in N. York, or Phil[a], he would have the acceptance of able coadjutors, and final[ly] the requisite artists.

Darlington answered on January 18, 1832:

> I perfectly agree with you, that a periodical publication, by a competent hand, devoted to the indigenous Botany of our Country, would be a most valuable work; but I almost despair of seeing such a thing in my day. Those which have been attempted, have proved sad failures. There are, in truth, but very few in our Country, who have the *materials*, & the requisite qualification; & those few seem to be otherwise employed. Mr. Nuttall *could* do it advisably; but I have understood he is becoming tired, or careless, of botanical pursuits, & devotes his attention to other studies. No man amongst us, is better qualified than Dr. Torrey; but I doubt whether the task would be compatible with his other engagements . . . The Patrons of botanical works, in the U. States, are almost too few, as yet, permanent publications of the character to which you refer. In the mean time, it seems to me, the best thing the students of Plants can do, is to supply themselves with good specimens, by means of exchanges; & in that way become acquainted with the indigenous vegetables of the country.

Evidently Short heeded the advice and accepted the situation as Darlington saw it. The project was not further discussed in their letters, but a new activity, the preparation of local floras, was already emerging.

Preparation of Local Floras

Aside from the exchange of dried, preserved plant specimens which occupied most of their correspondence, both Darlington and Short were interested in the preparation of local floras. Botanists of the period considered this activity the highest in order of contribution to botanical science. The Rev. Henry Muhlenberg (1753—1815) of Lancaster, Pennsylvania, had been convinced that knowledge of the entire flora of the country would best be assembled through the production of local floras by botanists working in their own neighborhoods.[33] In a letter to Darlington dated March 30, 1826 Schweinitz presented a similar opinion:

> I am most coadjacently [?] convinced that no greater service can be rendered Science—than by the publication of local Floras—& am extremely eager to see yours—tho' I deplore that you have not thought proper to include . . . Cryptogamia—[34]

Darlington agreed. In a letter of February 21, 1828 to Short he noted with pleasure that he had seen Short's proposal for a local flora, "Florula Lexingtoniensis."[35]

> I am much pleased to learn that you have undertaken such a work. It will be very gratifying to us, on this side of the mountains, to see a local Flora from the West; and I am confident that the interest you will, yourself, feel in the work, will increase in a geometrical ratio as you proceed.

Darlington continued the letter with several items of advice on procedures in preparation and publication. Then he said:

33. W. J. Youmans, "Sketch of Gotthilf Heinrich Ernst Muhlenberg," *Popular Science Monthly* 45 (1894): 689–798; idem, "Gotthilf Heinrich Ernst Muhlenberg 1753–1815," in *Pioneers of Science in America* (1896; reprint ed., New York: Arno, 1978), pp. 58–70.

34. Lewis D[avid von] Schweinitz to William Darlington, March 30, 1826, Darlington Papers, vol. 8, letter no. 10, New York.

35. C. W. Short, "*Prodromus Florulae Lexingtoniensis, secundum florendi aetatem digestae*," *Transylvania Journal of Medicine & Associate Sciences* 1 (1828): 92–99 (reprinted in Stuckey, *Scientific Publications*).

> I am satisfied it is only in this way that the materials for a *complete* American Flora can be procured: & the sooner we begin such works, the sooner shall we have the pleasure of seeing a production so much desired by all the cultivators of American Botany.

On February 25, 1829, after seeing three fascicles of Short's *Florula Lexingtoniensis* (1828),[36] Darlington continued to encourage Short, saying: "A local Flora, of the West, is much wanted."

As noted earlier, Darlington had published his *Florula Cestrica* (1826), but as time passed and more local specimens were added to the Chester County Cabinet of Natural Science, he saw the need for an expanded and up-to-date local flora. By 1835, as he noted in a letter of April 11 to Professor William J. Hooker of Glasgow, and a letter of October 12 to Dr. John Torry of New York City, Darlington was arranging materials for a revised edition of his local flora.[37] Outlining the project to Hooker, he wrote that he intended the work to be "as complete a local Flora as possible. . . ." Detailed descriptions were being prepared after comparisons of the plants with earlier descriptions. Every feature had to be verified. As he explained to Torrey, "I insert nothing but what I see or think I see in the plant. This makes my progress very slow and tedious."

The whereabouts of the letters that Darlington wrote to Short in 1835 and 1836 are not known,[38] but it can be inferred that during these years Darlington informed Short of his efforts to write a new local flora. In a letter dated December 28, 1835, Short asked Darlington, "How do you progress in your second edition of Florula Cestrica?" Darlington was anxious that Short should see the work and comment on it. The printing was completed in stages. On September 29, 1836, Short sent acknowledgment of the first printed sheets. After looking over them carefully and detecting no faults worth mentioning, Short wrote that he looked forward to the remaining portions. Additional installments were sent in the fall of 1836 and in January 1837. On April 22, 1837, Darlington sent the final pages and lamented the possible shortcomings of the work:

36. C. W. Short, "*Florula Lexingtoniensis, secundum florendi aetatem digestae*," *Transylvania Journal of Medicine & Associate Sciences* 1 (1828): 250–65, 407–22, 560–75; 2 (1829): 438–53 (reprinted in Stuckey, *Scientific Publications*).

37. Overlease, "Dr. William Darlington as a Botanist."

38. Davies, "Charles Wilkins Short, 1794–1863: Botanist and Physician," pp. 230–31.

> I feel quite relieved on getting through with it. It has been a much more laborious job than I anticipated, when I began it, & it is not quite so well executed as I could have wished: But in a village it is impracticable to get work completely done. With respect to my own share of the work, I am very conscious of its defects— & felt more & more so, as I advanced; but if it shall be found useful to our young Botanists,—or in any degree interesting to the older ones,—I shall think myself amply compensated. I expect to be condemned, without mercy, for retaining the Linnaean Classification; but I did not feel prepared to undertake an arrangement according to the Natural Method;—and, to tell the honest truth, I am not yet quite convinced that the Sexual System has not some advantages, for *beginners*—for whom my book is chiefly intended. You will perceive that I have briefly given my views, on this heed, in the Preface; & I calculate on having your sympathy, at least, in case I am abused for it,—inasmuch as you have intimated, heretofore [see Short's letters of March 30, 1835 and September 29, 1836] that you were old-fashioned enough to still entertain some regard for the Linnaean Method! I do not expect to have my sentence much mitigated, in consideration of the *middle course* I have pursued, —although I am very well satisfied with it. The Post's dogma, "in medio tutissimus," may be true in conducting the chariot of the Sun; —but it will not hold good in Politics, Religion, or Science. Partizans, in either of those pursuits, will not tolerate a middle course. If, however, my detailed descriptions of species shall be found reasonably correct, & intelligible, I shall not trouble myself about the strictures on the arrangement.

Short acknowledged receipt of the final pages on October 17, 1837, although he had received them much earlier.[39] He defended Darlington's employment of the Linnaean System of classification and he praised all aspects of the book as a valuable contribution to the flora of North America:

> I cannot refrain from again uttering the wish—the ardent desire, that we had a record as faithful as yours of the productions of every quarter of our country—then should we soon be in possession of that great desideratum; 'a complete Amerian Flora'!

Short enclosed a sheet from *The Transylvania Journal of Medicine and Associate Sciences*, containing his recent review of the *Flora*.[40] Its concluding statements were:

39. Wm. Darlington, *Flora Cestrica* (West Chester, Pa.: Siegfried, 1837).

40. C. W. Short, [Review of Darlington's *Flora Cestrica*] *Transylvania Journal of Medicine & Associate Sciences* 10 (1837): 499–506 (reprinted in Stuckey, *Scientific Publications*).

> It must be decidedly the best manual extant for the Botanist of the Middle Eastern States; and it will answer a valuable purpose in determining many of the plants of the Northern, Southern and Western States. Would that every county and district in our widespread land could boast of a history as faithful of their vegetable productions, as that given by Dr. Darlington in his *Flora Cestrica*.

During this period, the 1830s, Short had completed a descriptive catalogue of the spring flora in the vicinity of Lexington, published as a *Prodomus* (1828)[41] and *Florula Lexingtoniensis* (1828–1829),[42] and a *Catalogue of the Native Phaenogamous Plants, and Ferns of Kentucky* (1833),[43] the latter written in collaboration with his medical colleague, Dr. Robert Peter, and their field companion, Mr. Henry Griswold. Supplements to the *Catalogue* were published in 1834, 1835, 1837, 1840.[44] However, Short's hope of producing a definitive work on the flora of Kentucky was never realized.

The preparation of local floras by Muhlenberg, Schweinitz, Darlington, Short, and others, all came on the eve of Torrey and Gray's monumental definitive and documented *Flora of North America* (1838–1843),[45] prepared with the assistance of correspondents in all parts of the country. Seven parts were published in two volumes but the work was not finished as planned; left untreated were the families of the Monocotyledoneae and several families of the Dicotyledoneae, including the the Chenopodiaceae, Amaranthaceae, Fagaceae, Scrophulariaceae, Labiatae, and Boraginaceae. Despite these omissions the contribution was enduring and authoritative. In a letter of August 2, 1838, Torrey urged Darlington to:

41. Short, "*Prodromus Florulae lexingtoniensis, secundum florendi aetatem digestae.*"

42. Short, "*Florula Lexingtoniensis, secundum florendi aetatem digestae.*"

43. [C. W.] Short, [Robert] Peter, and [Henry A.] Griswold, "A catalogue of the native phaenogamous plants, and ferns of Kentucky," *Transylvania Journal of Medicine & Associate Sciences* 6 (1833): 490–501 (reprinted in Stuckey, *Scientific Publications*).

44. [C. W.] Short and [Robert] Peter, "A supplementary catalogue of the plants of Kentucky," *Transylvania Journal of Medicine & Associate Sciences* 7 (1834): 598–600; idem, "A second supplementary catalogue of the plants of Kentucky," *Transylvania Journal of Medicine & Associate Sciences* 8 (1835): 575–82; C. W. Short, "A third supplementary catalogue of the plants of Kentucky," *Transylvania Journal of Medicine & Associate Sciences* 10 (1837): 335–40; idem, "A fourth supplementary catalogue of the plants of Kentucky," *Western Journal of Medicine & Surgery* 2 (1840): 283–88 (all reprinted in Stuckey, *Scientific Publications*).

45. John Torrey and Asa Gray, *A Flora of North America* 2 vols. (1838–43; reprint ed., New York: Hafner, 1969).

> write a notice, more or less extended, as you see best of the flora, to be inserted in the next No. of Silliman's journal. As you are the oldest American botanist we look to you to do this service.[46]

Darlington's review, published in the issue of January 1839,[47] referred to the Torrey-Gray *Flora* as a "most laudable undertaking" and comprehensive work which "has been long and anxiously desired by the botanists of the United States." Not since the treatments by Pursh (1813)[48] and Nuttall (1818),[49] had botanists had an authoritative flora of continental scope. Since then, as Darlington noted, the botanists had only written

> *partial* or *local Floras*, highly interesting, indeed, so far as they extended, and furnishing valuable materials for a more comprehensive work; but still, they were severely limited in their scope, and, of necessity, incomplete in their contents. The materials thus existing in detached masses, and scattered through numerous volumes, awaited the plastic operation of some master hand, to reduce them into one consistent body, and give to all the parts their appropriate form and pressure. It was exceedingly important, that whoever might undertake to prepare a North American Flora, should be thoroughly acquainted with the labors of preceding botanists; and, by consulting their collections, as far as practicable, be competent to detect errors, adjust their discrepancies, and determine their various synonyms.

Darlington was pleased that the work had been undertaken by Torrey and Gray, whom he considered "among the best qualified for the task"; he urged that they receive "zealous cooperation and encouragement of every lover of the Science of Plants."

46. John Torrey to Wm. Darlington, August 2, 1838, Darlington Papers, vol. 8, letter no. 91, New York.

47. W[m.] D[arlington], "[Review of] *A Flora of North America*," *American Journal of Science* 35 (1839): 180–82.

48. Frederick Pursh, *Flora Americae Septentrionalis* 2 vols. (1813; reprint ed., Vaduz, Germany: J. Cramer, 1979).

49. Thomas Nuttall, *The Genera of North American Plants* 2 vols. (1818; reprint ed., New York: Hafner, 1971).

Preserving the History of Botany

Darlington and Short were strongly interested in the history of botany. In 1836 Short sketched a history of botany in western America,[50] and from time to time acknowledged publications of Darlington on the lives of botanists. On July 13, 1838, Short acknowledged a copy of a "West Chester paper containing interesting memoir . . . of the Botanists of Chester County" written by Darlington.[51] Then came the *Reliquiae Baldwininae* (1843),[52] which contained selections from the correspondence of the late William Baldwin with Henry Muhlenberg and William Darlington. In his acknowledgment, dated April 18, 1844, Short characterized this as a "very interesting volume, . . . and by the perusal of which I have since been highly entertained." Several works, including *Agricultural Botany* (1847),[53] from which Short derived additional pleasure, were acknowledged on June 9, 1848. Next Darlington published his *Memorials to John Bartram and Humphrey Marshall* (1849),[54] which included a descriptive essay on the "Progress of Botany in North America." Then came a memorial of his banker-botanist friend, David Townsend (1858),[55] which Short acknowledged on March 5, 1859. In his last known letter dated July 6, 1859, Short urged Darlington to write a "Biographia Americana Botanica," a work he considered Darlington most qualified to undertake:

> This is proved by your admirable sketches of the lives and labours of Bartram, Marshall, Baldwin &[c] and although but few since these days have done more and a great number have done enough to have their names rescued from oblivion by a few memorial pages—such for instance as those which you have recently devoted to your friend Mr. Townsend. It

50. C. W. Short, "A sketch of the progress of botany in western America," *Transylvania Journal of Medicine & Associate Sciences* 9 (1836): 324–50 (reprinted in Stuckey, *Scientific Publications*).

51. No publication with a title "Memoir . . . of the Botanists of Chester County" has been located. Short's reference to a "West Chester paper" suggests that the item appeared in a newspaper published in West Chester, Pa.

52. Wm. Darlington, *Reliquiae Baldwinianae* (1843; reprint ed., New York: Hafner, 1969).

53. Wm. Darlington, *Agricultural Botany* (Philadelphia: J. W. Moore, 1847).

54. Wm. Darlington, *Memorials of John Bartram and Humphrey Marshall* (1849; reprint ed., New York: Hafner, 1967).

55. W[m.] D[arlington], *Memorial of David Townsend* (West Chester, 1858).

> would afford me much pleasure, as I am quite sure it would others of your friends and fellow-labourers, to communicate information in regard to those Botanists with whom I have had most to do in the West—as the younger Eaton, Rafinesque, Peck, Gregg, and others.
>
> Please do think of this; and believe me my dear Sir, very affectionately and truly,
>
> Yours
> C.W. Short

On July 13, Darlington replied. He thanked Short for specimens he was still sending to the herbarium of the Chester County Cabinet of Natural Science. As to working on a biography of North American botanists, Darlington, now aged 77, was very positive:

> You are very kind—as well as complimentary—to suggest such a work for me, . . . If I were younger, and possessed of the requisite materials, it would afford me a great pleasure to labor in such a field. It is, however, quite out of the question, with me, now. I am not only destitute of *materials* for such a work, —but am conscious of a kind of lethargic habitude, which has overtaken me—with a strong and increasing disposition to *procrastinate* . . . every thing like a task.

In the same letter Darlington informed Short that Mrs. Isabella James, wife of the botanist Thomas P. James, was preparing an extensive tribute to the memory of botanists. This would take the form of biographical sketches; each was to be accompanied by an engraved portrait, a view of the subject's birthplace or favorite residence, a figure of a plant dedicated to the botanist, and a facsimile of an autograph letter. Darlington urged Short to contribute to Mrs. James's project. He then closed, by saying:

> Having now filled my paper,—most probably exhausted your patience, —I beg you to believe me ever your very sincere and oft-obliged Friend,
>
> Wm Darlington

These two letters, written in July 1859, were the last to be exchanged by the two botanists. At this time Darlington was 77, and Short, aged 64, had not long to live. Early in 1863 they died, Short on March 7 and Darlington on April 23. They had met only once, at Bartram's Garden in Philadelphia, during a brief visit in the summer of 1850. Short recalled the incident in a letter of September 23, 1850 to Dr. George

Englemann,[56] the St. Louis botanist, and in letters written to Darlington on April 6, 1856 and March 5, 1859 he commented on the meeting. The two botanists had many traits in common. They were dedicated to exhaustive field work, conducted in order to assemble specimens and collect knowledge; to building extensive herbaria through exchanges with other botanists; to the preparation of authoritative local floras; to the publication of their scientific work; and to the preservation of botanical history in written form.

Asa Gray's Tribute

Professor Asa Gray of Harvard University, the foremost contemporary authority on North American botany, had come to know Darlington personally and Short only through correspondence. He published a tribute to each in the *American Journal of Science*. Of Short, Gray wrote he was a "very industrious botanist, and an effectual promoter of science in this country," but possessed a most retiring disposition through which he shunned publicity and society.[57] Gray considered Short's major contribution to be his herbarium:

> His great usefulness in this field was mainly owing to the extent and particular excellence of his personal collections, and to the generous profusion with which he distributed them far and wide among his fellow-laborers in this and other lands. He . . . [was] the first in this country to prepare on an ample scale dried specimens of uniform and superlative excellence and beauty, and in lavish abundance for the purpose of supplying all who could need them. . . . The vast improvement in the character of the dried specimens now generally made by our botanists may be mainly traced to the example and influence of Dr. Short. . . . As might be expected, Dr. Short's own herbarium is a model of taste and neatness. It is also large and important.

Of Darlington, Gray noted he was a "venerable and excellent man. The Nestor, of American Botanists. . . ."[58] Gray mentioned the local floras as Darlington's major contribution:

56. C. W. Short to George Englemann, September 23, 1850, Englemann Correspondence, Library, Missouri Botanical Garden, St. Louis.

57. A[sa] G[ray], "Dr. Charles Wilkins Short," *American Journal of Science* 86 (1863); 130–39.

58. Gray, "The Late Wm. Darlington."

> His *forte* was in the clear and accurate description of plants; his desire, to make perfectly known the plants of his native country; his modest estimate of his own labors in his favorite pursuit was expressed in the motto of his *Florula Cestrica*, in 1826, and repeated in his classical *Flora Cestrica* (one of the very best local floras ever written) in 1837 and 1853.... Botany . . . was only the side-issue, the recreation of his life, which was actively devoted to professional and various civic occupations, and to the discharge of many honorable trusts.

On March 16, 1863 Gray wrote to William J. Hooker that "Short and Darlington were both hearty and true Christian gentlemen."[59]

Other Correspondents

Short contributed more than 500 plants from Kentucky to the Chester County Cabinet of Natural Science, now known as the Darlington herbarium, and undoubtedly he was Darlington's principal correspondent from the Ohio valley, but Darlington also had other botanical contacts on the western frontier. Clues to the identity of these correspondents, many of whom Darlington never met, are found in the studies of Robert B. Gordon[60] and in some of my own observations; both of these studies were based on specimens in the Darlington herbarium.

Among the western contributors of specimens during the late 1820s and the early 1840s were Dr. Johann Christopher Müller, Daniel Steinhauer, Dr. John Leonard Riddell, Thomas Gibson Lea, and Increase Allen Lapham. In the later years of his life Darlington established an extensive correspondence with Harry Beeson Flanner of Mt. Pleasant, Ohio. A knowledge of the contributions that these men made to the Darlington herbarium yield an improved understanding of the sources and contents of that valuable assemblage.

The farthest west that Darlington traveled was Pittsburgh, where he met with the Canal Board in the summer of 1816. On August 6 of that year he recorded:

59. Asa Gray to W. J. Hooker, March 16, 1863, in Jane Loring Gray, ed., *Letters of Asa Gray* vol. 2 (Boston: Houghton Mifflin, 1894), pp. 498–99.

60. Gordon, "The 'Darlington Herbarium' at West Chester." Robert B. Gordon prepared a later study which was never published—"The William Darlington Herbarium of the West Chester State College," typescript, 16 pp., 1974. Copy in possession of R. L. Stuckey.

> I went . . . to visit Mr. [George] Rapp's settlement called, Economy, about 18 miles below Pittsburgh, on right bank of the Ohio river. I spent most of my time there in viewing the Herbarium of Dr. Müller—who gave me some specimens of plants,—& to whom I presented a copy of my Florula Cestrica. . . . returned to Pittsburgh in the evening.[61]

Dr. Johann Christopher Müller,[62] who had accompanied George Rapp to America in 1803 and established the Harmony Society, was the Society's doctor, schoolmaster, and musical composer. He had obtained plants from the vicinity of Economy and from the banks of the Wabash River in southern Indiana, presumably in the neighborhood of New Harmony, when the Society was at that location from 1814 to 1824. Two subsequent letters from Müller to Darlington, dated June 12, 1827 and March 22, 1828, are extant.[63] In the first letter Müller stated that he was collecting the plants of the area; in the second he recorded 138 plant specimens that he was sending to Darlington. Approximately 25 specimens that Darlington received from Müller survive in the Darlington herbarium today.

In a letter dated March 6, 1825,[64] the Rev. Schweinitz introduced Darlington to Daniel Steinhauer (1785–1852),[65] a Moravian school teacher of Philadelphia. In a letter that Steinhauer wrote to Darlington on February 23, 1829,[66] Schweinitz was identified as a mutual friend. These events came after Steinhauer had returned from teaching in Ohio, at Zanesville in 1819–1920 and at Chillicothe in 1820–1822. While in Ohio he obtained botanical specimens, of which at least 51 are today in Schweinitz's herbarium at the Academy of Natural Sciences of Philadelphia.[67] Darlington evidently obtained some Ohio plants from Steinhauer, as about 15 of his specimens are still extant in the Darlington herbarium.

61. Wm. Darlington, *Diary of transactions, incidents, observations & reflections: or annals of the author* vol. 1, 1822–1862, entry for August 6, 1826, handwritten, Darlington Papers, New York.

62. Pitzer and Elliott, "New Harmony's first Utopians."

63. J. Christopher Müller to Wm. Darlington, June 12, 1827 and March 22, 1828, Darlington Papers, vol. 2, letter nos. 59 and 60, New York.

64. Lewis David von Schweinitz to Wm. Darlington, March 6, 1825, Darlington Papers, vol. 8, letter no. 7, New York.

65. John Hendley Barnhart, "The Botanical Correspondents of Schweinitz," *Bartonia* 16 (1935): 19–36.

66. D[aniel] Steinhauer to Wm. Darlington, February 23, 1829, Darlington Papers, vol. 2, letter no. 72, New York.

67. Ronald L. Stuckey, "Daniel Steinhauer, early Ohio plant collector, and his correspondence with the botanist Schweinitz," *Bartonia* 36 (1967): 1–24.

By the autumn of 1836, Dr. John Leonard Riddell (1807–1867),[68] who had received a medical degree under Daniel Drake in the Medical Department of the Cincinnati College and who, along with Drake, had established an active informal circle of botanical associates in Cincinnati, was Professor of Chemistry and Pharmacy in the Medical College of Louisiana at New Orleans. From there he sent at least two letters to Darlington, one on October 21, 1837 and the other on November 10, 1838. In both of these letters Riddell stated that he was sending packages of plants.[69] The first communication would have contained plants from Ohio, where Riddell had resided from 1832 to 1836. He asked Darlington: "Do you wish for southern plants . . .?" In the second communication, Riddell noted that the package contained plants " mostly . . . collected in 1838, in this state [Louisiana]." In return, Riddell sought plant specimens from Darlington. Gordon noted 92 specimens from Riddell in the Darlington herbarium.

Darlington's *Flora Cestrica* was sought by other botanists in the western frontier. Among them was Thomas Gibson Lea (175–1844),[70] who in 1827 retired from mercantile business in Cincinnati and pursued an interest in botany by preparing an excellent herbarium of the plants found within 10 miles of the city.[71] Four letters that Lea wrote Darlington are known to survive.[72] In the letter of July 4, 1837, Lea thanked Darlington for having written the *Flora Cestrica*, a book that contained "a full and accurate knowledge of our plants." The letter continues:

68. Karlem Reiss, "Special papers on the history of science—I: John Leonard Riddell," *Tulane Studies in Geology and Paleontology* 13 (1977): 1–110; Ronald L. Stuckey, "Medical Botany in the Ohio valley (1800–1850)," *Transactions and Studies of the College of Physicians of Philadelphia*, ser. 4, 45 (1978): 262–79, esp. pp. 270–73; Adolph E. Waller, "The vaulting imagination of John L. Riddell," *Ohio State Archaeological and Historical Society Quarterly* 54 (1945): 331–60.

69. J. L. Riddell to Wm. Darlington, October 21, 1837 and November 10, 1838, Darlington Papers, vol. 7, letter nos. 94 and 96, New York.

70. James Grant Wilson and John Fiske, eds., "Thomas Gibson Lea," *Appleton's Cyclopaedia of American Biography* (New York: D. Appleton, 1888), 3: 645.

71. Thomas G. Lea, *Catalogue of plants, native and naturalized, collected in the vicinity of Cincinnati, Ohio, during the years 1834–1844* (Philadelphia, 1849).

72. Thomas G. Lea to Wm. Darlington, July 4, 1837, January 14, 1838, January 20, 1839, and June 3, 1839, Darlington Papers, vol. 5, letter nos. 90–93, New York.

> The minute and discriminating descriptions go far to make up the want of figures, and I think that by means of the Flora Cestrica I shall be able to better the place of some specimens in my collection which I have held in dispute. I shall place it at the side of Nuttall Bigelow Elliott & Beck with Doct. Torreys expected general work. I anticipate that many difficulties heretofore existing will be corrected; & in using descriptive Botany perhaps there will be little left to add or amend. in viz only to flowering plants. In flowerless plants with the exception of Filices there may yet be much to ascertain & describe—The Mosses are highly interesting as well as beautiful & I have endeavored to collect for a few months past those in our vicinity. . . .

Lea stated also that he had been collecting plants industriously for nearly three seasons and wished to open an exchange of specimens with Darlington and to have him identify and authenticate doubtful items. Lea's susequent letters to Darlington, dated January 14, 1838, January 20, 1839, and June 3, 1839 discuss exchanges of plants and attempts to solve problems of identification. Lists of plants sent to Darlington are preserved in Lea's letterbook,[73] but the whereabouts of Darlington's letters to Lea are not known. Gordon estimated that there were only 12 specimens from Lea in the Darlington herbarium;[74] this seems to be a very small number compared to the number of plants, which totaled more than 200, that Lea had recorded in his letterbook. The current card file of the Darlington herbarium shows that approximately 215 specimens survive from Lea's contributions.

Increase Allen Lapham (1811–1875),[75] the first scientist and most distinguished scholar of Wisconsin in his time, engaged in an exchange of correspondence from 1829 to 1857.[76] Lapham first opened the

73. Thomas G. Lea, "Letterbook and record of specimens of plants and other objects of natural history sent to correspondents." Handwritten, undated. Manuscript Collection No. 139. Library, Academy of Natural Sciences of Philadelphia.

74. Gordon, "The 'Darlington Herbarium' at West Chester."

75. Milo M. Quaife, "Increase Allen Lapham, first scholar of Wisconsin," *Wisconsin Magazine of History* 1 (1917): 3–15; S. S. Sherman, *Increase Allen Lapham, LL.D., a biographical sketch read before the Old Settlers Club, Milwaukee, Wis., Dec. 11, 1875* (Milwaukee, 1876); N. H. Winchell, "Increase Allen Lapham," *American Geologist* 13 (1894): 1–38.

76. Increase A. Lapham to Wm. Darlington, August 7, 1829; draft by Wm. Darlington to I. A. Lapham, September 2, 1829, Library, Chester County Historical Society, West Chester, Pa. The author wishes to thank Dorothy I. Lansing, M.D., for supplying copies of these letters; Wm. Darlington to Increase A. Lapham, 10 letters from September 2, 1829 to February 2, 1857, Increase A. Lapham Papers, Manuscript Collection, Library, The State Historical Society of Wisconsin, Madison; I. A. Lapham to Wm. Darlington, 10 letters from March 19, 1837 to February 10, 1857, Darlington Papers, vol. 7, letter nos. 82–92, New York.

correspondence on August 7, 1829 when he was 18 years of age. At this time he lived in Shippingport, Kentucky and was employed as a rodman with the Louisville and Portland Canal Company. Initially he wanted to exchange shells for minerals, but on September 2, 1829 Darlington replied that he could not make an adequate exchange of mineral specimens. Instead he suggested an exchange of plants. In 1836 Lapham relocated permanently in Milwaukee, and the correspondence was renewed in 1837. An intermittent exchange of plants was maintained until 1843, the correspondence continuing until 1857. The two men also exchanged pamphlets and books that they had written. In a letter dated June 3, 1853, Darlington explained the circumstances involved in the publication of his *Agricultural Botany* (1847)[77] and the new edition of his *Flora Cestrica* (1853).[78] Of the former book, he wrote:

> The work belongs to my Son, who printed it, & resides in the City of *Lancaster*, in this state. . . . I merely mention this for information, as I have no interest whatever in the work. I gave my Son the manuscript, on condition that he would print it. I also gave him the copyright of a *New Edition* of my *Flora Cestrica*, which has just appeared. It is arranged in the *natural method* . . . Of course, it contains nothing that is *new to you* & I only state it as an article of intelligence. My chief object, in getting out this new edition of the *Flora*, was to arrange the Plants in *Natural Families*; and as the City *Booksellers* were so shy of a work, which did not promise to pay as well as modern novels, that they declined touching it, or risking a dollar in the publication. I therefore gave it to my Son, to print it, if he chose to risk it. He has printed it very neatly. . . . This, in all probability, will be my last attempt of the Kind,—being now some distance on the shady side of *three score and ten*.

In the later years of his life, Darlington took pupils to study botany, much as he had earlier taken pupils to study medicine. He regarded this activity as part of his work in popular education. His pupils had a great respect and an affectionate regard for him. This teacher-student relationship in botany was not limited to West Chester but developed also among some of Darlington's correspondents during his later years. One of these pupil-correspondents on the western frontier was Harry Beeson Flanner (1820–1863),[79] a farmer and part-time school teacher of

77. Darlington, *Agricultural Botany*.

78. Wm. Darlington, *Flora Cestrica: An Herborizing Companion for the Young Botanists of Chester County, State of Pennsylvania*, 3rd ed. (Philadelphia: Lindsay & Blakiston, 1853).

79. Descriptive notes, typewritten, 9 pp. Correspondence of Henry Beeson Flanner Family, 1803–1874. Manuscript Collection, Library, Indiana Historical Society, Indianapolis.

Mt. Pleasant, Jefferson County, Ohio, who strongly desired to learn about plants. Their known correspondence[80] began with Flanner's letter of March 4, 1855 and concluded with Darlington's letter of April 5, 1862. It discussed the exchange of a few living and dried botanical specimens and also contained comment on individual species of plants, descriptive notes about deceased and living botanists, and remarks about books useful for botanists. Flanner's purpose was made clear in his letter of March 18, 1855.

> I was aware of your age and did not expect you to Exchange much with me. I wished more to receive some *Fatherly* Counsel and advice From your long Experience in Botanical Pursuits. I have desired to learn something of our American Botanists.

The last three letters to Darlington relate that Flanner, his wife, and seven children removed to Dent County, Missouri, in the fall of 1856, where Flanner taught school and bought land, in the expectation of founding a univeristy based on the tutorial system used at Oxford. During the Civil War, Flanner lost the property and all his other possessions in an invasion by Morgan's Raiders. Sick and destitute, Flanner returned with his family to Mt. Pleasant, Ohio, by the spring of 1862. He died on May 26, 1863, at the age of 43, one month after the death of Darlington.[81]

Summary

Darlington's correspondence with botanists on the western frontier, an activity which spanned nearly 35 years of his life, brought him pleasure and friendships, as well as great knowledge of the plants of a region that was undergoing permanent settlement. His western correspondents added botanical specimens to the Chester County Cabinet of Natural Science and thereby helped him attain the goals of that organization,

80. Wm. Darlington to Henry Beeson Flanner, 17 letters from March 8, 1855 to April 5, 1862, Correspondence of Henry Beeson Flanner Family, 1803–1874, Manuscript Collection, Library, Indiana Historical Society, Indianapolis; H. B. Flanner to Wm. Darlington, 12 letters from March 4, 1855 to March 30, 1862, Darlington Papers, vol. 1, letter nos. 247, 331–37, 341–43, 509, New York; H. B. Flanner to Wm. Darlington, June 26, 1856, attached to sheet of *Carex latifolia*, Darlington Herbarium, West Chester State College, West Chester, Pa.

81. Descriptive notes, Correspondence of Henry Beeson Flanner Family.

which he had founded and conducted. Darlington's interaction with botanists of the western frontier was a small but important phase in the development of botany in North America.

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Medical Journals of Pennsylvania Before the Civil War

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TWENTIETH century physicians and librarians find it difficult to imagine the study and practice of medicine without the ubiquitous journal; the earliest American medical practitioners lacked this forum, since the American medical periodical did not appear until the end of the eighteenth century. Physicians, if they had any formal medical education at all, received it mainly in Europe. Very often anyone with a superficial knowledge of medicine could be considered a doctor. In addition, it was not unusual for clergymen to practice medicine.

Even before the American Revolution physicians felt the need to share their knowledge. The first medical school in the United States, the University of Pennsylvania Medical Department, was established in Philadelphia in 1765. Many distinguished physicians and writers were graduated from this school, including John Redman Coxe, editor of the *Philadelphia Medical Museum*, which was Pennsylvania's first and the country's second medical journal. Only four medical schools were in existence in the United States by 1799 (five had been established), and the total number of graduates was 221.[1] Only one American medical journal had made its debut by this time—the *Medical Repository*, which was established in New York in 1797.

The early development of medical periodicals seems to have been related to the founding of medical schools.[2] The journal provided a platform for the exchange of information and the expression of opinions of professors. Many journals were started but few were long-lived; some never went beyond one volume. The ephemeral character of early medical periodicals has been attributed to several factors. Among these are the condition of the national economy, personal costs in time and money, and various personal motives, such as dissension among physicians. The cost of publication was high and the scanty advertising did little to defray expense. In 1824, the *Philadelphia Journal*

1. Edward H. Clarke, *Century of American Medicine* (1876; reprint ed., New York: Burt Franklin, 1971), p. 359.

2. Leartus Connor, "The American medical journal of the future as indicated by the history of American medical journals in the past," *Journal of the American Medical Association* 2 (1884): 650–57.

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of the Medical and Physical Sciences sold for five dollars per year, which was quite expensive for that time.[3] The annual subscription rate for the *Philadelphia Medical and Physical Journal* was two dollars in 1804. John S. Billings observed, "The motive for the existence of the minor journals is not for direct profit but as an indirect advertisement for certain individuals, or—and this is more common—the desire to have a place in which the editor can speak his mind and attack his adversaries without restraint."[4]

The first journals were small by today's standards, measuring about six by nine inches. Volumes contained about four to six hundred pages, with page numbers of issues being numbered consecutively. Most were leather-bound. Both paper and binding were of good quality, and the specimens that have survived in historical collections are in remarkably good condition. Volumes might be reprinted if sufficient demand arose. A second edition of the first and second volumes of the *Medical Repository* appeared in 1800, and a third edition in 1804–05.[5]

Contents of early volumes reflected the interests of the profession and many case reports and extensive reviews of recent publications were published. Reprints of foreign articles were included when this could be arranged.[6] Three Pennsylvania journals included reference to foreign literature or medicine in their titles. News, editorials, and even social comments were contributed for publication.

Medical societies often published their proceedings and transactions. Pennsylvania has five such examples prior to the Civil War. The *Transactions of the College of Physicians of Philadelphia* began in 1793, prior to the publication of the first Pennsylvania medical journal, and continues to appear. This periodical, now *Transactions and Studies of the College of Physicians of Philadelphia*, is in its fifth series. The *Proceedings of The Medical Society of the State of Pennsylvania* began in 1848, was superseded by its *Transactions*, and is now continued in *Pennsylvania Medicine*. The *Transactions of the American Medical Association* made its debut in Philadelphia in 1848. Some societies later chose to report their transactions in journals

3. Henry B. Shafer, "Early medical magazines in America," *Annals of Medical History* n.s. 7 (1935): 480–91.

4. Clarke, *Century of American Medicine*, p. 340.

5. Ibid., p. 330.

6. Shafer, "Early medical magazines in America," p. 484.

rather than in annual volumes. The *Medical Reporter* of the Chester and Delaware County medical societies enjoyed a short life, from 1853 to 1856. This journal combined medical society proceedings and original articles.

Epidemics played an important role in the initiation and continuance of medical periodicals. Information-starved practitioners, apprehensive of rampant smallpox, yellow fever, dysentery and other communicable diseases, sought the quickened exchange of knowledge that journals could provide. The inception of the *Cholera Gazette* in Philadelphia in 1832 corresponded to the first of the three nationwide cholera epidemics that afflicted the United States.

The present study, a survey of medical journals published in Pennsylvania, begins with the first medical journal in that state, published in 1804, and ends in 1860. During this period, twenty-eight medical journal titles were initiated in Pennsylvania, five transactions or proceedings, two cyclopedic publications, two monographic serials, and fourteen periodical titles peripheral to medicine. Only three Pennsylvania medical periodicals were published outside of Philadelphia. Two periodicals were published entirely in German. Only one medical journal that began before 1860 survives today.

Medical journals are defined here as serials or periodicals that deal with scientific medical topics and are issued at stated intervals, whether weekly, monthly, quarterly, or irregularly. Peripheral medical periodicals are defined for the purpose of this paper as: 1) serials having as their primary emphasis topics which relate to medicine but are not in the mainstream, eg. homeopathic and eclectic medicine, or 2) serials that are monographs or books having only one topic which is discussed in depth. Encyclopedic publications, which treat a particular subject comprehensively and usually are arranged alphabetically, are excluded from the list of medical journals. Thus in the present essay some encyclopedic or monographic publications which have appeared previously in lists of early periodicals[7] are separated from medical journals as defined here.

7. John Shaw Billings, "The medical journals of the United States," *Boston Medical and Surgical Journal* 100 (1879): 1–14; Myrl Ebert, "The rise and development of the American medical periodical, 1797–1850," *Bulletin of the Medical Library Association* 40 (1952): 243–76; Samuel D. Gross, *History of American Medical Literature from 1776 to the Present Time* (Philadelphia: P. Madiera, 1875); Burton A. Konkle, *Standard History of the Medical Profession of Philadelphia* 2nd ed. (New York: AMS Press, 1977).

In discussing each journal, biographical information about editors has been included because the content and focus of any journal reflects the background and interests of its editor and because the editors of these journals set the foundations of American medicine. While it is not possible to discuss the individual editors extensively, it is hoped that the brief information that we have supplied will add value and interest to the descriptions of the journals.

Pennsylvania Journals

The first Pennsylvania medical journal was the *Philadelphia Medical Museum*, a quarterly begun in September 1804 and edited by John Redman Coxe, M.D. The *Museum* was composed largely of case reports and papers on folk cures and remedies.[8] Coxe was educated in London and Edinburgh and received his degree from the University of Pennsylvania in 1794. He became the founder of medical journalism in Pennsylvania. In addition he was a proponent of vaccination when this preventive measure was not generally accepted. He was professor of chemistry, pharmacy, and materia medica at the University of Pennsylvania, was instrumental in founding the Philadelphia College of Pharmacy, and wrote the *American Medical Dictionary* and the *American Dispensatory*.[9] He is credited with ownership of the largest private library of his time; it contained an estimated 15,000 volumes, including classics of medicine and religion.[10] The *Museum* ceased publication in 1811, and Coxe turned his attention to the production of a literary magazine.

The second medical journal in Pennsylvania, the *Philadelphia Medical and Physical Journal* (also known as *Barton's Medical Journal*) appeared in November 1804, only two months after the inception of the *Museum*. Its editor, Benjamin Smith Barton, is known largely for his work in botany. His *Elements of Botany* is the first work on the subject to be published in the United States. It has been supposed that Barton completed his medical studies at Edinburgh but refused to accept his

8. Richard H. Shryock, *Medicine in America: Historical Essays* (Baltimore: Johns Hopkins Press, 1966), p. 215.

9. John M. Armstrong, "The first American medical journals," in *Lectures on the History of Medicine, 1926–1932* (Philadelphia: Saunders, 1933), pp. 357–69.

10. Victor Robinson, "The early medical journals of America; founded during the quarter-century, 1797–1822," *Medical Life* 36 (1929): 533–86.

diploma because two professors had slighted him.[11] It has been said that he received his degree from Göttingen and then, in 1789, returned to Philadelphia to practice medicine.[12] Information unearthed recently in Barton's papers indicates that this is incorrect and that Barton received a medical degree from Christian-Albrechts University at Kiel in 1796. It appears that he entered practice in Philadelphia without a degree and that Benjamin Rush was aware of this deficiency.[13] Barton is recognized as the father of American materia medica.[14] His principal medical publication was his study of the geographic distribution of goiter in the United States.[15] In May 1809, after five years of irregular issues, his journal ceased to appear. It had made no contribution to medical science comparable in merit to Barton's botanical writings.

The *Eclectic Repertory and Analytical Review*, a quarterly journal, began publication in Philadelphia in 1811. It was subsequently called the *Journal of Foreign Medicine* and the *Journal of Foreign Medical Science and Literature*. The editors were Thomas T. Hewson, John C. Otto, Thomas C. James, and Joseph Parrish.

Thomas T. Hewson, born in England, came to Philadelphia in 1786. After completing undergraduate studies at the University of Pennsylvania, he returned to England in 1794 for medical education at St. Bartholomew's Hospital. Returning to Philadelphia to practice, he became physician to the Walnut Street Prison. In 1822 he established a private medical school, where he taught anatomy. His work in the preparation and revision of the *National Pharmacopoeia* is especially notable.[16]

11. Whitfield J. Bell, "Benjamin Smith Barton (Kiel)," *Journal for the History of Medicine and Allied Sciences* 26 (1971): 197–203.

12. Ralph H. Major, *A History of Medicine* 2 vols. (Springfield, Ill.:Thomas, 1954), p. 767.

13. Bell, "Benjamin Smith Barton," p. 199.

14. William S. Middleton, "Benjamin Smith Barton," *Annals of Medical History* n.s. 8 (1936): 477–91.

15. Armstrong, "The first American medical journals," p. 363.

16. Howard A. Kelly and Walter L. Burrage, *Dictionary of American Medical Biography: Lives of Eminent Physicians of the United States and Canada from the Earliest Times* (New York: Appleton and Co., 1928), pp. 563–64.

John Conrad Otto is remembered for having written the first American description of hemophilia; this work appeared when he was 29 years of age.[17] Otto was born in 1774 to a family with three generations of medical tradition. He studied under Dr. Benjamin Rush and was graduated from the University of Pennsylvania in 1796. In 1798 he was elected a physician to the Philadelphia Dispensary and in 1813, when Rush died, he became a physician to the Pennsylvania Hospital. He practiced medicine in Philadelphia during the numerous yellow fever epidemics (contracting the disease himself in 1798) and during the cholera epidemic of 1832.[18]

Thomas Chalkley James, the son of a merchant, was born in Philadelphia in 1776. He was educated at Friends Academy and studied medicine under Adam Kuhn; he was graduated from the University of Pennsylvania in 1787. In 1788 he became the doctor on a merchant vessel. Through shrewd investment, he secured enough money to finance several years of study in London and Edinburgh. Upon returning to the United States he began the practice and teaching of obstetrics. He was professor of midwifery at the University of Pennsylvania from 1810 to 1834.[19] He succeeded Coxe as a physician to the Pennsylvania Hospital, a position in which he served for twenty-five years.[20] His most important written contribution to obstetrics, "Case of Premature Labor, Artificially Induced," appeared in 1811 in the *Eclectic Repertory*. James was an originator of the Pennsylvania Historical Society and was active in military service in the suppression of the Whiskey Rebellion.[21]

Joseph Parrish was born in 1779 of Quaker parents. His early education was obtained at Friends School in Philadelphia. An apprentice hatter for a time before entering the study of medicine with Caspar Wistar, he was graduated from the Medical School of the University of Pennsylvania in 1805. He served as physician to the Philadelphia

17. James Bordley and A. McGehee Harvey, *Two Centuries of American Medicine, 1776–1976* (Philadelphia: Saunders, 1976), pp. 81, 561.

18. Edward B. Krumbhaar, "John Conrad Otto and the recognition of hemophilia," *Bulletin of the Johns Hopkins Hospital* 46 (1930): 123–40.

19. Herbert Thoms, "Thomas Chalkley James, pioneer in the teaching of obstetrics in America," *American Journal of Obstetrics and Gynecology* 29 (1935): 289–94.

20. Hugh L. Hodge, "Biography of Thomas C. James, M.D.," *American Journal of the Medical Sciences* n.s. 6 (1843): 91–106.

21. Thoms, "Thomas Chalkley James," p. 293.

Dispensary, the Philadelphia Almshouse, and the Pennsylvania Hospital. He was president of the Board of Managers of Wills Hospital, and was active in the College of Physicians, the Philadelphia Medical Society, and the American Philosophical Society. He campaigned for prison reform and for the abolition of slavery. Parrish wrote one book, *Practical Observations on Strangulated Hernia and Some Diseases of the Urinary Organs*, published in 1836. He died in 1840. His greatest legacy was the medical education of scores of students.[22]

In 1821 the *Eclectic Repertory* changed its title to the *Journal of Foreign Medicine*. The new editors were Samuel Emlen and William Price. No information about Price could be found. John D. Godman, who edited the fourth volume of the periodical, will be discussed later.

Samuel Emlen, born in Chester County, studied medicine under Joseph Parrish. He received his degree from the University of Pennsylvania in 1812 and later studied in England, France, and Holland. Because of experience on the Philadelphia waterfront, he possessed much information about yellow fever. He was also the organizer of the Philadelphia Society for Discouraging the Use of Ardent Spirits. He died in 1828 at the age of 39.[23]

The *Eclectic Repertory* reprinted a number of noteworthy foreign articles. Early volumes carried reprints of English and Scottish writings. Later volumes contained papers from France, including a reprint titled "Laennec's New System of Diagnosis" as well as a number of other materials and correspondence of French origin. This emphasis reflected the opinion of early American physicians that the Napoleonic reorganization of France's hospital system had made French medical practice superior.[24]

Four American medical classics have ensured the immortality of the *Eclectic Repertory*.[25] In 1811, John Syng Dorsey reported the first successful ligation of the external iliac artery in the United States. Volume 3 of the *Repertory* included Philip Syng Physick's report of the

22. William S. Middleton, "Joseph Parrish, Quaker preceptor," *Annals of Medical History* 3rd ser. 4 (1942): 343–69.

23. Charles D. Meigs, "Biographical notices of Samuel Emlen, M.D.," *North American Medical and Surgical Journal* 6 (1828): 139–46.

24. Shryock, *Medicine in America*, pp. 219–20.

25. Lee Ash, *Serial Publications Containing Medical Classics* (New Haven: Antiquarian, 1961). All subsequent references to medical classics are from Ash.

use of gastric lavage for the treatment of poisoning. In 1816, Physick contributed to the *Repertory* an innovative paper "Buckskin and Kid Ligatures." Ephraim McDowell issued "Three Cases of Extirpation of Diseased Ovaria" in the seventh volume (1817), and gained acclaim as a pioneer ovariotomist.

The next medical journal to appear in Pennsylvania was the *American Medical Recorder*, a quarterly published in Philadelphia. The *Recorder* was founded by John Eberle, a Lancaster County "Dutchman,"[26] whose writings were of excellent quality, as was his penmanship. Apprenticed to a country doctor while in his teens, Eberle went on to enter the University of Pennsylvania for the three terms necessary to obtain a degree in medicine. Graduating in 1809, he returned to the Lancaster area and opened a practice at the Four Mile Tavern. He saw military service as a regimental surgeon during the War of 1812. Upon returning to Lancaster he became editor of a German political newspaper, which supported unpopular views and led to his medical and financial ruin. He removed to Philadelphia, and in 1818 became the editor of the *American Medical Recorder*. In 1822 he published *A Treatise of the Materia Medica and Therapeutics*, which was an immediate success. It went through four editions and was translated into French and German. Eberle was one of the founders of Jefferson Medical College.[27] In 1831 he removed to Ohio, where he helped found the *Western Medical Gazette*.

In 1820 and 1821, Eberle was joined by Granville Sharp Pattison, Henry William Ducachet, and John Revere in the editorial duties of the *American Medical Recorder*. Eberle and Ducachet co-edited the fifth volume (1822), and in 1823 the sixth was "conducted" by an association of physicians. Samuel Colhoun (also called Calhoun), assisted by an association of physicians, edited volumes seven through ten. With volume eleven, the *Recorder*'s editorship changed to James Webster, Caleb B. Matthews, Isaac Remington, and an association of physicians.

Published from 1818 through 1829, the *Recorder* contained abstracts and translations of foreign literature as well as contributions from North American authors. Six medical classics were included in its pages. In the third volume (1820) William Gibson reported the first case of ligation of the common iliac artery. The first case of excision of

26. "Dutchman" is a Pennsylvania colloquialism for a person of German extraction.

27. Samuel X Radbill, "John Eberle, Pennsylvania Dutch pioneer in American medical education," *Bulletin of the Institute for the History of Medicine* 4 (1936): 121–36.

the superior maxilla for tumor was discussed in 1821 by Horatio Gates Jameson. In 1822, Nathan Smith reported a case of ovariotomy, thus becoming the second physician in the United States to report this procedure. William H. Deadrick issued his "Successful Case of Removal of a Portion of the Lower Maxillary Bone" in 1823, and in volume 11 (1828) Horatio G. Jameson presented a 70-page essay, "Observations upon Traumatic Hemorrhage, Illustrated by Experiments upon Living Animals." William Beaumont's famous experiments on the physiology of digestion appeared in two papers in volumes eight and nine (1825–26). As is well known, this study was conducted on Alexis St. Martin, a French-Canadian trapper who was treated by Beaumont for gastric fistula. The two articles precede by seven and eight years Beaumont's book, *Experiments and Observations on the Gastric Juice and the Physiology of Digestion*, which was published in 1833.

The *Philadelphia Journal of Medical and Physical Sciences*, precursor of the *American Journal of Medical Sciences*, was a quarterly founded in 1820 by Nathaniel Chapman in response to a biting commentary by Sydney Smith printed in the *Edinburgh Review*.

> The Americans are a brave, industrious, and acute people, but they have hitherto made no approaches to the heroic, either in their morality or their character. During the thirty or forty years of their independence, they have done absolutely nothing for the sciences, for the arts, for literature, or even for the statesmanlike studies of politics and political economy. . . . In the four quarters of the globe, who reads an American book? or goes to an American play? or looks upon an American picture or statue? What does the world yet owe to American physicians or surgeons? What new substances have their chemists discovered, or what old ones have they analyzed? What new constellations have been discovered by the telescopes of Americans? What have they done in mathematics? Who drinks out of American glasses, or eats out of American plates, or wears American coats or gowns, or sleeps in American blankets?

As long as Chapman was editor, Smith's remark was carried on the title page of the *Philadelphia Journal* as a reminder. Chapman, a wealthy, charming Virginian, came to Philadelphia at the age of 17 to study under Benjamin Rush. After graduating from the University of Pennsylvania in 1800 he devoted four years to study in England and Scotland. He then settled in Philadelphia, where he became a successful and respected physician. In 1813 he succeeded Dr. Rush in the chair of materia

medica at the University of Pennsylvania and later succeeded Dr. Barton in the chair of practice of medicine, institutes, and clinical medicine. Having lost part of his palate in early life, Chapman suffered from impairment of speech, but this did not impede his career. "[A]t least, it gives character to his manner of speaking, and with other peculiarities, makes him a highly original and attractive teacher."[28] From all accounts he was a congenial man but apparently he was capable of holding a grudge, as is shown by his treatment of Sydney Smith's insult. Nathaniel Chapman was the first president of the American Medical Association and made a large contribution to the prestige of the American medical profession.

The *Philadelphia Journal* covered all aspects of medical practice. Epidemics and recommendations for their control received special emphasis. Other subjects included toxicology, materia medica, obstetrics, and gynecology. Lengthy reviews were frequent. "Discussion of materia medica, especially extraction of new drugs from vegetable forms, occupied a significant amount of space in the journal."[29]

William Potts Dewees and John D. Godman joined the editorial staff in 1825, followed by Isaac Hays in February 1827.[30] Dewees, a native of Potts Grove [Pottstown], was acclaimed as the "father of American obstetrics."[31] His Philadelphia practice was begun before his receipt of a medical degree from the University of Pennsylvania in 1789.[32] His most famous books on obstetrics and gynecology, *A Compendious System of Midwifery* (1824) and *On the Diseases of Females* (1826) ran through twelve and ten editions respectively. Dewees is credited also with writing one of the landmark pediatrics texts in this country, *Treatise on the Physical and Medical Treatment of Children* (1825). He was a master in the use of obstetrical forceps and performed more than 10,000 deliveries.[33]

John Godman was orphaned at the age of five years. Poverty and illness could not overcome his natural talent. He was graduated from

28. Cato (pseud.), "Sketches of eminent living physicians: Nathaniel Chapman, M.D.," *Boston Medical and Surgical Journal* 40 (1849): 216–19, 242–43.

29. Charles L. Losacco, "Philadelphia Journal of the Medical and Physical Sciences, 1820–1827," *Bulletin of the History of Medicine* 34 (1960): 75–79.

30. Ibid., p. 77.

31. Josiah C. Trent, "Obstetrics and gynecology in America IV. William Potts Dewees," *North Carolina Medical Journal* 8 (1947): 244–46.

32. Major, *A History of Medicine*, p. 767.

33. Trent, "William Potts Dewees," p. 245.

the University of Maryland, where he completed his medical studies despite virtual starvation. He taught anatomy and physiology briefly in Philadelphia, then became professor of surgery at the Medical College of Ohio. He lost this position soon after his mentor, Daniel Drake, became involved in faculty strife and was dismissed. Drake had issued proposals for a medical journal and Godman carried out the plan, founding the *Western Quarterly Reporter of Medical, Surgical and Natural Sciences*. Godman thus "had the honor of being the first to commence a journal of medicine in the Valley of the Mississippi."[34] Returning to Philadelphia, he lectured in anatomy and supervised the Philadelphia Anatomy Rooms, where he became known as a pioneer pathologist.[35] Godman joined the editorial staff of the *Philadelphia Journal* and from 1825 to 1827 discharged almost all of the editorial duties of that journal.[36] He died of tuberculosis at the age of 36.[37]

The *Philadelphia Journal* contained four papers considered to be classics; two were contributed by Philip Syng Physick. The first by Physick appeared in 1822 and introduced the use of setons for the treatment of ununited fractures. In 1826, Physick described a procedure for the creation of an artificial anus. The eighth volume (1824) contained William Edmonds Horner's description of what was known as Horner's muscle, also called the tensor tarsi but now designated as the pars lacrimalis of the orbicularis oculi. In 1827, Valentine Mott reported successful ligation of the common iliac artery.

In 1827, Godman having removed to New York to become professor of anatomy at Rutgers Medical College,[38] Isaac Hays became sole editor of the *Journal*. The *Philadelphia Journal* was renamed the *American Journal of the Medical Sciences*, and is the only pre-Civil War Pennsylvania medical journal that continues to be published.

34. William Snow Miller, "John Davidson Godman," *Annals of Medical History* n.s. 9 (1937): 293–303.

35. Shryock, *Medicine in America*, pp. 216–17; idem., *Medicine and Society in America: 1660–1860* (New York: New York University Press, 1960), p. 128.

36. Losacco, "Philadelphia Journal," p. 77.

37. Esmond R. Long, "Some early American pathologists," *Transactions and Studies of the College of Physicians of Philadelphia* 4th ser. 36 (1968–69): 22–23.

38. Miller, "John Davidson Godman," p. 300 (At the time that Godman moved to New York, Rutgers was located in New York but chartered in New Jersey.); Frank L. Mott, *A History of American Magazines, 1740–1850* (New York: Appleton, 1930), p. 567.

The *Aesculapian Register* had a brief career, from June 17 to December 4, 1824. It was a weekly, edited by several physicians, and originated in Philadelphia.

The next journal to appear was the *Medical Review and Analectic Journal* in 1824. Only one volume carried this title; the next two volumes were titled the *American Medical Review and Journal of Original and Selected Papers in Medicine and Surgery*. Its editors were George McClellan and John Eberle; the latter is mentioned above. McClellan, father of the famous Gen. George B. McClellan, was graduated from the Univeristy of Pennsylvania in 1819 and had a brilliant surgical career. In 1821 he and Eberle founded a private school that attracted large numbers of students and later became known as Jefferson Medical College.[39] A collection of McClellan's case reports and essays, published posthumously, included a noteworthy description of shock.[40]

The only paper of consequence to be published in the *Medical Review* was "On the Amputation of the Knee Joint" by Nathan Smith (vol. 2, 1825). Smith is believed to have been the first physician in the United States to amputate a knee joint. The *American Medical Review* ceased publication in 1826.

The *North American Medical and Surgical Journal* was published from 1826 to 1831 and was edited by Hugh Lenox Hodge. In his early years Hodge was interested primarily in surgery. He studied under Caspar Wistar and was graduated from the University of Pennsylvania in 1818. Immediately after graduation he enlisted as a ship's surgeon. He sailed to India, where he worked in cholera hospitals; this experience proved valuable during the 1832 cholera epidemic in Philadelphia.[41] Because of rapidly failing eyesight, Hodge was persuaded by Dewees to change from surgery to obstetrics. In 1835 he was appointed professor of obstetrics at the University of Pennsylvania. By 1863 further visual impairment caused him to resign his professorship. His greatest work, *Principles and Practices of Obstetrics* (1864), was prepared by dictation and with the editorial assistance of the author's son.[42]

39. Radbill, "John Eberle," p. 128.

40. Clarke, *Century of American Medicine*, p. 304.

41. Herbert Thoms, "Hugh Lenox Hodge: A master mind in obstetrical science," *American Journal of Obstetrics and Gynecology* 33 (1937): 886–92.

42. Ibid., p. 889.

Only a single major contribution appeared in the *North American Medical and Surgical Journal.* In a paper titled "On the Treatment of Anchylosis by the Formation of Artificial Joints" (vol. 3, 1829), John Rhea Barton described an osteotomy for ankylosis.

As previously noted, the year 1827 marked the birth of the *American Journal of the Medical Sciences.* It resulted from the merger of three journals, the *American Medical Recorder*, the *Philadelphia Journal of the Medical and Physical Sciences*, and the *Philadelphia Monthly Journal of Medicine and Surgery.* The last-named was edited by Nathan Ryno Smith. Smith was educated at Yale and at first practiced medicine in Vermont. Later he went to Philadelphia for further study. Through friendship with Dr. George McClellan he obtained a chair in anatomy at Jefferson Medical College. Two years later, in 1827, he transferred to the University of Maryland, where he remained until he died. Although his reputation rests on his invention of the lithotome, he felt that his greatest contribution to surgery was the anterior splint.[43] Fondly known as Baltimore's "Emperor," Smith dominated surgical thought in that city for nearly 40 years. Samuel D. Gross remarked, "Dr. Smith was one of the most distinguished surgeons that our country has produced. As a mechanical surgeon, he has justly occupied a high rank."[44]

Only one classic article appeared in the *Philadelphia Monthly Journal of Medicine and Surgery.* This was Nathan Smith's "Observations on the Pathology and Treatment of Necrosis," an account of osteomyelitis published in 1827.

The *American Journal of the Medical Sciences* was edited solely by Isaac Hays, who remained on its staff for fifty-two years and was succeeded by his son, I. Minis Hays. The elder Hays was born in Philadelphia in 1796 and was graduated from the University of Pennsylvania in 1820 after having studied under Nathaniel Chapman. He is recognized as a pioneer in ophthalmic surgery and devised an operation for strabismus. Although Hays made many contributions to the literature of ophthalmology, he wrote no original textbooks and never held any professorial chairs. In 1827, when he became chief editor of the *American Journal of the Medical Sciences*, he gathered thirty-nine distinguished physicians to assist him as contributing editors. His journal survives today. Hays was

43. Kelly and Burrage, *Dictionary of American Medical Biography*, pp. 1135–37.

44. Randolph Winslow, "Nathan Ryno Smith," *Surgery, Gynecology and Obstetrics* 42 (1926): 852–54.

one of the founders of the Franklin Institute and was active in the founding of the American Medical Association, serving as chairman of the committee that drew up its famous Code of Ethics. He died in 1879, at the age of 83.[45]

Between 1828 and 1860 the *American Journal of the Medical Sciences* issued twenty-five articles that can be regarded as medical classics. Among them were papers by Valentine Mott on the treatment of aneurism (1829–1837) and on excision of the clavicle (1828). In 1837, in an important essay titled "On the Typhus Fever, which Occurred at Philadelphia in the Spring and Summer of 1836," William W. Gerhard differentiated between typhus and typhoid fever. Whitman Wilcox described rat-bite fever in 1840. In 1839, George Hayward described the treatment of vesicovaginal fistula and in 1852, James Marion Sims described his own operation for this lesion.

The *Monthly Journal of Foreign Medicine*, edited by Squier Littell and published in Philadelphia, appeared in 1828. It lasted through three volumes and ceased publication in 1829. Littell, an ophthalmologist, was born in New Jersey. Orphaned at an early age, he was adopted by an uncle of the same name who resided in Ohio. Returning to Philadelphia, he worked under Joseph Parrish and was graduated from the University of Pennsylvania in 1824. He was surgeon at Wills Eye Hospital from 1834 to 1863. Littell's *Manual of Diseases of the Eye* was one of this country's earliest books on the subject.[46] In 1835, Littell published in the *American Journal of the Medical Sciences*, "A Quarterly Report of Diseases Treated at Wills Hospital for the Blind and Lame, with Some Account of the Hospital." This statement proved historically important both to ophthalmology and to the Wills Eye Hospital.

A number of journals appeared throughout the 1830s; most of them had only a brief career in the original form and format. The *Cholera Gazette* (1832), edited by Isaac Hays, is mentioned above. The *American Lancet* (1833) was edited by F. S. Beattie, about whom no information has been obtained. The periodical, a biweekly, published only five issues and contained no medical classics.

The *Eclectic Journal of Medicine*, edited by John Bell through four volumes (1836–40), became the *Bulletin of Medical Science* (1841–46). Bell

45. Samuel D. Gross, "Obituary notice of Isaac Hays," *American Journal of the Medical Sciences* n.s. 78 (1879): 281–92.

46. Burton Chance, "Squier Littell, M.D.: A founder of American ophthalmology," *Annals of Medical History* n.s. 1 (1929): 50–56.

was of Irish birth. He was graduated from the University of Pennsylvania and taught at the Philadelphia Medical Institute and the Medical College of Ohio. His most important contributions to American medicine dealt with hygiene. His first book, *A Treatise on Baths and Mineral Waters*, was published in 1831. John S. Billings noted that it was the only comprehensive and respectable treatise on the subject published in this country at that time.[47]

In November 1836, the *American Medical Library and Intelligencer*, edited by Granville Sharp Pattison and Robley Dunglison, was issued as a prospectus. Pattison, born and educated in Glasgow, was a colorful person and has been referred to as the "argumentative anatomist."[48] He held five professorial chairs, including positions at the University of Maryland, Jefferson Medical College, and the University of New York. His life moved from crisis to crisis. The first, a reprimand from the Glasgow Royal Infirmary, was followed by arraignment and trial for bodysnatching. Escaping this, he became involved in a divorce scandal, in which he was named co-respondent.[49] This affair led to a longstanding quarrel with Nathaniel Chapman, which culminated in a duel with Chapman's brother-in-law, General Thomas Cadwalader. Cadwalader was wounded in his pistol arm, which never regained complete function, while Pattison was unscathed.[50] Pattison then returned to London to accept the chair of anatomy at the University of London, from which he was dismissed by the University Council for no clear reason. He died a respected member of the faculty of the University of New York in 1851 at the age of 60.[51]

The *American Medical Intelligencer* evolved from the *American Medical Library and Intelligencer* in 1837 and lasted until 1842, when it became the *Medical News and Library* (1843–79). The editor was Robley Dunglison, an Englishman educated in England, Scotland, and France. At Thomas Jefferson's invitation, Dunglison accepted a chair at the University of Virginia. He became Jefferson's personal physician and recorded

47. Clarke, *Century of American Medicine*, p. 320; Kelly and Burrage, *Dictionary of American Medical Biography*, p. 89.

48. Robert A. Shanks, "Granville Pattison and the uses of history," *Scottish Medical Journal* 11 (1966): 267–76.

49. Ibid., p. 271.

50. Kelly and Burrage, *Dictionary of American Medical Biography*, pp. 950–51.

51. Clarke, *Century of American Medicine*, pp. 126–27.

Jefferson's death in his diary.[52] He later held positions at the University of Maryland and at Jefferson, where he was professor of the institutes of medicine. He wrote many books, each having several editions; his most notable work was his *Medical Dictionary*.[53]

Medical Examiner, edited by John Barclay Biddle, Meredith Clymer, and William Wood Gerhard, began publication in 1838. The fifth and sixth volumes appeared under the title of *Medical Examiner and Retrospect of the Medical Sciences*. In 1845 it was superseded by the *Medical Examiner and Record of Medical Science*.

John Barclay Biddle began his education in law but soon gave it up to study medicine under Nathaniel Chapman. A graduate of the University of Pennsylvania in 1836, he continued his medical pursuits in Paris. He was professor of materia medica and therapeutics at Franklin Medical College, Pennsylvania Medical College, and Jefferson Medical College, and was president of the Association of American Medical Colleges. He produced a *Review of Materia Medica for the Use of Students* (1852), the eighth and last edition of which was printed in 1878.[54]

Meredith Clymer was graduated from the University of Pennsylvania in 1837 and after studying abroad, returned to Philadelphia to practice. He was one of this country's early neurologists and became professor of nervous and mental diseases at Albany Medical College. Like so many other physicians of the period, he served in the armed forces during the Civil War.[55]

William Wood Gerhard was born in Philadelphia in 1809. He studied under Parrish and was graduated from the University of Pennsylvania in 1830. He then studied in Paris and in Great Britain, returning to Philadelphia in 1833. He was the senior physician at Pennsylvania Hospital for 25 years[56] and was on the staff of the Philadelphia Almshouse. Gerhard was one of the founders of the Pathological Society of Philadelphia (1838). Osler is said to have

52. William B. Bean, "Robley Dunglison, M.D.," *Archives of Internal Medicine* 115 (1965): 375–80.

53. Clarke, *Century of American Medicine*, p. 319.

54. "John B. Biddle" (obituary notice), *Boston Medical and Surgical Journal* 100 (1879): 162–63; Ellerslie Wallace, "John B. Biddle, M.D., 1815–1879," *Transactions of the Medical Society of Pennsylvania* 12 (1879): 850–52.

55. Kelly and Burrage, *Dictionary of American Medical Biography*, p. 236.

56. Clarke, *Century of American Medicine*, p. 315.

described Gerhard as an "indefatigable worker."[57] He produced original papers on cholera, smallpox, tuberculous meningitis, and pneumonia.[58]

Several classics appeared in the *Medical Examiner*. John Rhea Barton reported his "Views and Treatment of an Important Injury of the Wrist" in the *Medical Examiner and Record of Medical Science* in 1838. The injury described has become known as Barton's fracture of the radius. In 1849, in a paper titled "The Heart-Clot," Charles Meigs drew attention to coronary coagula as causes of sudden death.

The *Philadelphia Medical Advertiser* (1843?, 1844–45) was published in Philadelphia and lasted through only one volume. It was distributed gratis by Pleasants and Maris, wholesale druggists.

The *Medical Examiner* joined the *Louisville Review* (Kentucky) in 1856 to form the *North American Medico-Chirurgical Review*, which was published in Philadelphia and edited by Samuel David Gross and Tobias G. Richardson. Five volumes appeared between 1857 and 1861. The third volume (1859) includes a description of a plastic operation for exstrophy of the bladder, performed by Joseph Pancoast and reported by Gross.

Samuel David Gross, one of the most eminent American surgeons of his time, was graduated from Jefferson Medical College in 1828 and entered private practice in Easton, Pennsylvania. From there he moved on to professorships at various medical schools until he finally settled in a position at Jefferson in 1856, where he became a legend. He wrote many papers and several outstanding books. One of the most famous, his *System of Surgery*, appeared in 1859. He founded three societies: the Pathological Society of Philadelphia, the Academy of Surgery of Philadelphia, and the American Surgical Association. Through Gross American medical and surgical practice gained international repute.[59]

Tobias Richardson was born in Kentucky in 1827. A student of Gross, he was graduated from the medical department of the University of Louisiana and subsequently became professor of anatomy and surgery there. Most of his work was done in New Orleans, where he held the chair in surgery at Tulane University. He was president of the American Medical Association in 1878.[60]

57. Kelly and Burrage, *Dictionary of American Medical Biography*, p. 460.

58. Ibid.; William S. Middleton, "William Wood Gerhard," *Annals of Medical History* n.s. 7 (1935): 1–18.

59. John H. Gibbon, "Samuel D. Gross," *Annals of Medical History* 8 (1926): 136–40.

60. Kelly and Burrage, *Dictionary of American Medical Biography*, pp. 1034–35.

Only two of the medical journals that were issued in Pennsylvania before 1860 came from cities other than Philadelphia. These were the *Eclectic Medical Review of Pittsburgh* (1847–48), edited by Lincoln Oldshue, and the *Medical Reporter* (1853–56), published in West Chester by the Chester and Delaware County medical societies. Lincoln Oldshue, born in 1820 in Ashland, Ohio, was a graduate of the Reformed Medical College of New York, an eclectic school. He practiced privately in Pittsburgh and wrote a book titled *Urino-Pathology*. He was professor of pathology at the Eclectic Medical College of Philadelphia from 1862 to 1867. Oldshue is said to have refined oil in the basement of his office.[61] The *Eclectic Medical Review* can be regarded as a borderline medical journal, which represented a combination of the Thomsonian cult and the botanic school of medicine.

Three other medical journals appeared in Philadelphia in the decade before the Civil War. *Nordamerikanischer Monatsbericht für Natur und Heilkunde* (1850–52) was published in four volumes. Edited by Wilhelm Keller and Heinrich Tiedemann, the journal was written entirely in German. No biographical information about the editors could be found.

The *Philadelphia Medical and Surgical Journal*, a semimonthly edited by James Bryan, issued only six volumes (1852–58). James Bryan, a Welshman, emigrated to America in 1818. He apprenticed himself to a hatter in Philadelphia but an overriding interest in medicine led him to enroll in the University of Pennsylvania Medical Department, from which he was graduated in 1834. Bryan was professor of surgery at Philadelphia College of Medicine from 1846 to 1856 and later became professor of anatomy at New York Medical College. He served as a surgeon during the Civil War. His most notable work, *Anatomy, Physiology and Diseases of the Human Ear*, was published in 1851.[62]

The *Medical and Surgical Reporter*, a weekly periodical edited by Samuel W. Butler and Richard J. Levis, began in 1858 and issued seventy-eight volumes through 1898. Butler was born in Georgia and received his medical education from the University of Pennsylvania. He served for a time as superintendent physician of the department for the insane at the Philadelphia Almshouse.[63]

61. *Biographical Review. Containing Life Sketches of Leading Citizens of Pittsburg and the Vicinity* vol. 24 (Boston: Biographical Review Publishing Co., 1897).

62. Kelly and Burrage, *Dictionary of American Medical Biography*, p. 161.

63. Ibid., p. 184.

Levis, a graduate of Jefferson Medical College (1848), worked in both general and ophthalmic surgery. He was an attending surgeon at Wills Eye Hospital, Pennsylvania Hospital, and Philadelphia Hospital. During the Civil War he was Surgeon-in-Chief of two United States military hospitals in Philadelphia. He was a founding member of the Philadelphia County Medical Society and served as president in 1885 and 1886. He presided over the Medical Society of the State of Pennsylvania in 1888.[64] He introduced the wire loop for the extraction of cataracts.[65]

Related Pennsylvania Periodicals

Fourteen medical periodicals which may be considered peripheral originated in Pennsylvania during the period prior to the Civil War. Some represent medical sects, such as homeopathy and Thomsonianism. Since homeopathy was German in origin, it is no surprise that one of the three Pennsylvania periodicals represented was written entirely in the German language. *Korrespondenzblatt der Homöopathischen Ärzte* (*Nordamerikanische Akademie der Homöopathischen Heilkunst*) was published in Allentaun [Allentown] in 1835, and lasted two years. Both the *American Journal of Homoeopathy* and its reissue, *Miscellanies on Homoeopathy* were published in Philadelphia in 1838.

The Thomsonians used botanic drugs only. The practitioners, for the most part, did not attend medical schools, but they did offer an early version of prepaid health insurance. The Thomsonians produced two journals in Pennsylvania—the *Philadelphia Thomsonian Sentinel and Family Journal of Useful Knowledge* (eight volumes, 1835–44) and the *Philadelphia Thomsonian Medical Journal* (1853–54).

Two health periodicals for laymen appeared in Philadelphia. These were edited by physicians for the general public. The *Botanic Medical Reformer and Home Physician* began in 1840 and was devoted to herbal medicine. The *Journal of Health* (1829–33), later titled the *Journal of Health and Recreation*, included articles on such timely topics as ladies on horseback, dietetic experience, diseases of artisans, confessions of a drunkard, and purification of water.

64. "R. J. Levis" (obituary notice), *Transactions of the American Surgical Association* 9 (1891): xxiv–xxv.

65. Kelly and Burrage, *Dictionary of American Medical Biography*, p. 739.

Four titles included in earlier lists of medical journals are really monographic serials. These are the *American Cyclopedia of Practical Medicine and Surgery* (two volumes, completing the letter "A," edited by Isaac Hays), *Medical and Surgical Monographs*, also known as *Dunglison's American Medical Library* (three volumes, 1838–40), *Cyclopedia of Practical Medicine* (four volumes, 1845), and the *Select Medical Library and Eclectic Journal of Medicine*, which continued as the *Select Medical Library and Bulletin of Medical Science*. The last-named is a series of monographs. Each is bound with an issue of either the *Eclectic Journal of Medicine* or the *Bulletin of Medical Science*.

Two dental journals and one journal of pharmacy were published in Philadelphia. These are the *Journal of the Philadelphia College of Pharmacy* (which continued as the *American Journal of Pharmacy*), the *Dental Intelligencer and Record of Theoretical and Practical Dentistry*, and the *Dental Newsletter*.

Two other publications of the period are the *Emporium of Arts and Sciences* (1812–14, edited by John Redman Coxe), and the *Medical Intelligencer and Literary Advertiser* (1842). Both were published in Philadelphia.

Although it was founded in 1854 in Dover, Delaware, the *Middle States Medical Reformer and Advocate of Innocuous Medication*, edited by John S. Prettyman and Palemon John, became a Pennsylvania publication in 1855 and remained so, through several title changes, until it ceased publication in 1871. Other titles by which it was known include the *Middle States Medical Reformer and Journal of Health* (1856–57), the *Eclectic Medical Journal of Philadelphia* (1858–65), *The Philadelphia University Journal of Medicine and Surgery*, and the *University Journal of Medicine and Surgery* (1865–71).

Summary

Medical journals have been important in the development of medical practice in this country. They were needed by a profession starved of information. The journals published in Pennsylvania before the Civil War were among the first in the country. They represent the format by which much medical knowledge was transmitted at that time, and they served also as models for the coming age of medical journalism. John Shaw Billings wrote: "Through the medical journals have been given to the world nearly all the discoveries which the science and art of medicine owes to American physicians. They furnish the original data

which are the foundations of the monographs and textbooks, and their files remain interesting and valuable when the latter have become obsolete and are forgotten."[66]

Nathaniel Chapman would have been proud.

LIST OF JOURNALS

Journals are listed in the order in which they appeared. Titles are followed by places of publication. Frequency of publication and the volumes published are followed by the names of the editors. Additional information concerning continuations or name changes is given last. The *Union List of Serials* and the *Index-Catalogue of the Library of the Surgeon-General's Office* have been used as guides to resolve any discrepancies.

// indicates that the journal ceased publication

n.s. designates new series

Medical Journals of Pennsylvania Before the Civil War

1804 *Philadelphia Medical Museum.* Philadelphia. Quarterly.
v. 1–6, S 17 1804–09; n.s. v. 1, 1810–11//
Editor: John Redman Coxe

1804 *Philadelphia Medical and Physical Journal.* Philadelphia. Quarterly.
v. 1–3, N 1804–08//
Editor: Benjamin Smith Barton
(Also known as *Barton's Medical Journal*)

1811 *Eclectic Repertory and Analytical Review.* Philadelphia.
v. 1–10, O 1811–20.
Editors: Thomas T. Hewson, John C. Otto, Thomas C. James, Joseph Parrish
(Changed title to *Journal of Foreign Medical Science and Literature* in 1821)

66. Robinson, "The early medical journals of America," p. 585.

1818 *American Medical Recorder.* Philadelphia.
v. 1–16 no. 2, 1818–Ap 1829//
Editor: John Eberle, et al.
(v. 2–12 as *Medical Recorder of Original Papers and Intelligence in Medicine and Surgery.* Merged into *American Journal of the Medical Sciences.* v. 14 omitted in numbering; v. 15 no. 2, Ap 1829, incorrectly numbered v. 16 no. 2)

1820 *Philadelphia Journal of the Medical and Physical Sciences.* Philadelphia. Quarterly.
v. 1–14, Ja 1820–D 1827//
Editors: Nathaniel Chapman, William P. Dewees, John D. Godman, Isaac Hays
(v. 10–14 also as n.s. v. 1–5. Superseded by *American Journal of the Medical Sciences* in 1827)

1821 *Journal of Foreign Medical Science and Literature.* Philadelphia. Quarterly.
n.s. v. 1–4, 1821–24//
Editors: Samuel Emlen (v. 1–3), William Price (v. 1–2), and John D. Godman (v. 4)
(Continues the *Eclectic Repertory.* v. 1–4 also labeled v. 11–14. Also known as the *Journal of Foreign Medicine.* Merged into *American Medical Recorder*)

1824 *Aesculapian Register.* Philadelphia. Weekly.
v. 1, Je 17–D 9 1824//

1824 *Medical Review and Analectic Journal.* Philadelphia. Quarterly.
v. 1–3, Je 1824–Ag 1826//
Editors: John Eberle and George McClellan
(v. 2 and 3 under the title of *American Medical Review and Journal of Original and Selected Papers in Medicine and Surgery*)

1826 *North American Medical and Surgical Journal.* Philadelphia. Quarterly.
v. 1–12, Ja 1826–O 1831//
Editors: Hugh L. Hodge, et al.

1827 *Philadelphia Monthly Journal of Medicine and Surgery.* Philadelphia.
v. 1–2 no. 3, Je 1827–F 1828//
Editor: Nathan Ryno Smith
(Merged into *American Journal of the Medical Sciences* in February 1828)

1827 *American Journal of the Medical Sciences.* Philadelphia.
v. 1–26, N 1827–40; n.s. v. 1– , 1841–
Editor: Isaac Hays
(Formed by the merger of the *Philadelphia Journal of the Medical and Physical Sciences*, the *American Medical Recorder*, and the *Philadelphia Monthly Journal of Medicine and Surgery*)

1828 *Monthly Journal of Foreign Medicine.* Philadelphia.
v. 1–3, Ja 1828–Je 1829//
Editor: Squier Littell
(Also known as *Spirit of the European Medical Journals*)

1832 *Cholera Gazette.* Philadelphia. Weekly.
v. 1 no. 1–16, Jl 11–N 21, 1832//
Editor: Isaac Hays

1833 *American Lancet.* Philadelphia. Biweekly.
v. 1 no. 1–8, F 23–My 29, 1833//
Editor: F. S. Beattie

1836 *Eclectic Journal of Medicine.* Philadelphia. Monthly.
v. 1–4, N 1836–O 1840.
Editor: John Bell
(Changed title to *Bulletin of Medical Science*)

1836 *American Medical Library and Intelligencer.* Philadelphia.
November 1836.
Editors: Granville Sharp Pattison and Robley Dunglison
(Continued as *American Medical Intelligencer* in 1837)

1837 *American Medical Intelligencer.* Philadelphia. Monthly.
v. 1–4, Ap 1 1837–Mr 15 1841; n.s. v. 1, Jl 1841–D 1842//
Editor: Robley Dunglison
(Superseded by *Medical News and Library* in 1843)

1838 *Medical Examiner.* Philadelphia. Biweekly.
v. 1–7, Ja 1838–44.
Editors: John B. Biddle, Meredith Clymer, William W. Gerhard
(v. 5 and 6 under the title of *Medical Examiner and Retrospect of the Medical Sciences.* Became *Medical Examiner and Record of Medical Science* in 1845)

1841 *Bulletin of Medical Science.* Philadelphia.
n.s. v. 1–2, 1841–42; s.3 v. 1–4, 1843–46//
Editor: John Bell
(Continues *Eclectic Journal of Medicine*)

1843 *Medical News and Library.* Philadelphia. Monthly.
v. 1–87, 1843–1905//
(Supersedes *American Medical Intelligencer.* Became *Medical News.* Merged into *New York Medical Journal*, later *Medical Record*)

1844 *Philadelphia Medical Advertiser.* Philadelphia.
v. 1 no. 1–3, 1844–45// (1843?)

1845 *Medical Examiner and Record of Medical Science.* Philadelphia.
n.s. v. 1–12, 1845–D 1856//
(Supersedes *Medical Examiner* and *Medical Examiner and Retrospect of the Medical Sciences.* United with *Louisville Review* [Kentucky] to form *North American Medico-Chirurgical Review*)

1847 *Eclectic Medical Review.* Pittsburgh.
v. 1–2 no. 6, 1847–O 1848//?
Editor: Lincoln Oldshue

1850 *Nordamerikanischer Monatsbericht für Natur und Heilkunde.* Philadelphia.
v. 1–4, Jl 1850–Je 1852//
Editors: Wilhelm Keller and Heinrich Tiedemann

1852 *Philadelphia Medical and Surgical Journal.* Philadelphia. Semimonthly.
v. 1–6, Je 1852–Je 1858//
Editor: James Bryan

1853 *Medical Reporter.* West Chester, Pa. Quarterly.
v. 1–3, Jl 1853–Ap 1856//
(Includes proceedings of the Chester and Delaware County medical societies)

1857 *North American Medico-Chirurgical Review.* Philadelphia. Bimonthly.
v. 1–5, 1857–61//
Editors: Samuel David Gross and Tobias G. Richardson
(Formed by the union of the *Medical Examiner and Record of Medical Science* and the *Louisville Review* [Kentucky])

1858 *Medical and Surgical Reporter.* Philadelphia. Weekly.
v. 1–78 no. 5, O 1 1858–My 16 1898//
Editors: Samuel W. Butler and Richard J. Levis
(Supersedes *Medical and Surgical Reporter*, Burlington, N.J.)

Medical Proceedings and Transactions Published in Pennsylvania Before the Civil War

1793 *College of Physicians of Philadelphia. Transactions.* Philadelphia.
v. 1, 1793//

1841 *College of Physicians of Philadelphia. Transactions and Studies.* Philadelphia.
v. 1–3, N 1841–50; n.s. v. 1–4, N 1850–My1874; s.3 v. 1–54, 1875–1932; s.4 v. 1–45, 1933–78; s.5 v. 1– , 1979–

1848 *American Medical Association. Transactions.* Philadelphia.
v. 1–33, 1848–82//
(Continued in *Journal*)

1848 *Medical Society of the State of Pennsylvania. Proceedings.* Philadelphia.
v. 1–3, 1848–50//
(Superseded by its *Transactions*)

1851 *Medical Society of the State of Pennsylvania. Transactions.* Philadelphia.
v. 1–5, 1851–55; n.s. pt. 1–5, 1856–60; s.3 pt. 1–3, 1862–64; s.4 pt. 1–3, 1865–67; s.5 pt. 1–2, 1868–69; s.6 pt. 1–3, 1870–71; v. 9–27, 1872–96//
(Supersedes its *Proceedings.* Continued in *Pennsylvania Medical Journal*)

Medical Monographic Serials Published in Pennsylvania Before the Civil War

(Formerly Considered to be Medical Journals)

1834 *American Cyclopedia of Practical Medicine and Surgery.* Philadelphia.
v. 1–2, 1834–36//
Editor: Isaac Hays
(Completes the letter "A")

1836 *Select Medical Library and Eclectic Journal of Medicine.* Philadelphia.
v. 1–4, 1836–40//
(Continued as the *Select Medical Library and Bulletin of Medical Science*)

1838 *Medical and Surgical Monographs.* Philadelphia.
v. 1–3, 1838–40//
(Also called *Dunglison's American Medical Library*)

1845 *Cyclopedia of Practical Medicine.* Philadelphia.
v. 1–4, 1845//
Editors: John Forbes, Alexander Tweedie and John Conolly; revised by Robley Dunglison

Journals Peripheral to Medicine Published In Pennsylvania Before the Civil War

1812 *Emporium of Arts and Sciences.* Philadelphia.
v. 1–2, My 1812–Ap 1813; n.s. v. 1–3. Je 1813–O 1814//
Editor: John Redman Coxe

1825 *Journal of the Philadelphia College of Pharmacy.* Philadelphia.
v. 1, 1825–27; n.s. v. 1–6, 1829–35.
(Continued as *American Journal of Pharmacy*)

1829 *American Journal of Pharmacy.* Philadelphia.
v. 1– , Ap 1829–
(v. 1–6, 1829–35 as *Journal of the Philadelphia College of Pharmacy*)

1829 *Journal of Health.* Philadelphia.
v. 1–4, S 9 1829–Ag 1833//
(v. 4 also called the *Journal of Health and Recreation*)

1835 *Korrespondenzblatt der Homöopathischen Ärzte.* Allentown.
v. 1–2 no. 3, O 22 1835–Je 22 1837//?
(Continued by *Nordamerikanische Akademie der Homöopathischen Heilkunst*, v. 1, 1837–)

1835 *Philadelphia Thomsonian Sentinel and Family Journal of Useful Knowledge.* Philadelphia.
v. 1–8, Ag 12 1835–Je 1844//
(v. 1–2, *Botanic Sentinel and Literary Gazette*; v. 3–4, *Philadelphia Botanic Sentinel and Thomsonian Medical Revolutionist*)

1838 *American Journal of Homoeopathy.* New York; Philadelphia.
v. 1 no. 1–6, Ag 1838–Jl 1839//

1838 *Miscellanies on Homoeopathy.* Philadelphia.
v. 1, Ag 1838–Je 1839//
(A reissue of the *American Journal of Homoeopathy*)

1840 *Botanic Medical Reformer and Home Physician.* Philadelphia.
v. 1–2 no. 7, My 7 1840–Ja 1842//

1842 *Medical Intelligencer and Literary Advertiser.* Philadelphia.
v. 1 no. 1–2, My–S 1842//

1843 *Dental Intelligencer and Record of Theoretical and Practical Dentistry.* Philadelphia.
v. 1–4, S 1 1843–48//
(v. 1–3 no. 13, 1843–O 1847 as *Stockton's Dental Intelligencer*)

1847 *Dental News-letter.* Philadelphia.
v. 1–12 no. 4, O 1847–Jl 1859//
(Superseded by *Dental Cosmos*)

1853 *Philadelphia Thomsonian Medical Journal.* Philadelphia.
v. 1–2, Ap 1853–54//

1859 *Dental Cosmos.* Philadelphia.
v. 1–78 no. 12, Ag 1859–D 1936//
(Supersedes *Dental News-letter*)

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ESSAY-REVIEW

DOWLING, HARRY F. *City Hospitals: The Undercare of the Underprivileged.* Cambridge: Harvard University Press, 1982. 245 pages. Price $22.50.

Reviewed by PASCAL JAMES IMPERATO

HAD it not been for the closure of religious institutions in the 1530s by King Henry VIII of England, the history of city- and county-owned hospitals in the United States would be quite different from what it actually is. King Henry's actions and subsequent laws enacted by parliament ultimately shifted what had been the assumed responsibility of religious groups to local communities. Various acts of parliament between 1552 and 1601 put the burden of care of a variety of people on local governments. These groups of people included the aged, chronically ill, disabled, homeless women, foundlings, orphans, the insane, feeble-minded, alcoholics, and individuals with acute illness who could not be cared for at home. All of them were housed in what became known as the almshouse-workhouse, along with petty criminals, vagrants, and prostitutes.

In the opening section of his fascinating account of the history of city hospitals, Harry Dowling writes in great detail about the almshouse period of public medical care in both the United States and Great Britain. His treatment of this grim but long period in the history of medical care—it lasted for almost three hundred years in Great Britain—is superb. Enough detail is included to orient the reader and to provide a sufficient background for understanding the subsequent evolution of city hospitals.

The voices of social conscience, including that of Charles Dickens, resounded strongly about the deplorable conditions in almshouse-workhouses. By the time of the American Civil War, politicians sensitive to public sentiment took measures that eventually resulted in a separation of medical care from the other functions of the almshouse. Coincidentally, the need for public hospitals became imperative because of the enormous influx of poor immigrants from Europe in the preceding decades and their settlement in towns and cities, where they came to be a significant proportion of the population. The almshouse had outlived its viability as a means of dealing with an ever-expanding demand for medical care for the urban poor. Other alternatives had to be found.

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1983 by The College of Physicians of Philadelphia.

The confluence of social consciousness, political advantage, and practical necessity created a fertile environment for the emergence of what would eventually become public hospitals. Some of these institutions, such as Bellevue and Philadelphia General, originated in almshouses. Others, like Boston City and Cook County, were founded in the 1860s specifically for the sick poor. The author recounts in some detail the development of Boston City Hospital and explains that its birth was directly related to the inability of Massachusetts General to care for the growing numbers of sick poor in Boston, many of whom were recent Irish immigrants. He contrasts this with the development of Philadelphia General, which for a long time retained a strong link with the residuary functions of the almshouse.

Charity Hospital in New Orleans, which has been a major teaching affiliate of both Tulane University and Louisiana State University for many years, stands out in contrast to the other public hospitals in that it originated as a private hospital and was at one time an almshouse as well. Dr. Dowling recounts this piece of medical history in a lively fashion and includes some fascinating details. But it is in painting the broader canvas of what transpired in America's cities, socially, politically, demographically, and economically, during the second half of the nineteenth century, that he succeeds in telling us not so much what happened but why it happened. In so doing he provides hospital history in a large historical context. And within the narrower focus of hospital history he carefully describes the interplay of two opposing forces—politics and professional administration—in the development of public hospitals. During this period of American history, municipal and county politics was usually of parochial interest only, revolving around local issues and personalities without much linkage to the national scene. Rampant corruption, on a scale that would scandalize the American public today, was commonplace. In New York City it led to an almost predictable cycle in which the public, expressing its outrage, voted corrupt Tammany Hall mayors out of office, in favor of reform candidates. But once the public memory faded, the Tammany politicians came back into power.

The early development of public hospitals from 1860 on must be viewed as nothing short of miraculous considering the political climate of the times. But as Dowling observes, although city hospitals suffered a great deal at the hands of plundering politicians, they also increased in size and improved their services. In large measure this was the result of

growing professionalism among hospital administrators and of medical advances that made it easier to determine objectively who should be admitted and who should not be. The paid lackeys of political machines, who previously had influenced admission decisions, and even regimens of treatment, on behalf of constituents, gradually saw their influence fade as doctors increasingly made professional and not political decisions about patients. By the end of the nineteenth century, physicians and professional administrators were in firm control of most public hospitals. Although political influence was still present, it was on the wane. The physicians who dominated the public hospital scene were, as the author describes them, forceful individuals who operated from no outside institutional base. Drawn by the opportunities for learning, teaching, power, and prestige presented by public hospitals, they gradually transformed these institutions from pesthouses into what we today recognize as hospitals.

Later in the second section of the book the author deals with the interconnected subjects of practitioner-doctors, city hospitals, and medical schools. He traces the long and complex development of associations between city hospitals and medical schools and in so doing describes splendidly the evolution of residency training programs and specialty services. House officerships were often obtained through personal and political connections and not on the basis of ability and merit. But as the nineteenth century moved toward its close, abuses of this kind became rarer.

In the mid-nineteenth century the physician staffs of public hospitals consisted of individuals who worked in private practice and who individually spent time working in hospitals. Dowling makes the important observation that by 1910 staffs had at least become loose confederations of doctors who had some common interests and aims but no central direction or control of medical affairs. The superstar practitioner-doctors tended to attract loyalty from the house staffs and others, and they as well as their lesser-known colleagues improved the medical care in the public hospitals by applying advances in medical science. Dowling observes that these practitioner-physicians applied the advances according to their abilities and ambitions while they taught colleagues and house staff informally.

The last forty years of the nineteenth century also witnessed gradual but dramatic changes in the way in which medical students and house officers obtained their training. Interns were originally nothing more

than ad hoc assistants, but eventually they became graduate physicians. Similarly, medical students, while originally observer-apprentices, eventually learned in the more formal setting of the amphitheater. Still, these changes hinged on the individual practitioner-doctors, on their abilities, knowledge, and commitment to teach. Medical schools were still rather peripheral to the public hospitals until the early twentieth century. And as the author underscores, the schools essentially became interrelated with the hospitals through the practitioner-doctors who served simultaneously on the faculty of a school and on the staff of a public hospital.

In closing the first section of his book Dr. Dowling discusses the lack of adequate nursing care, support services, and decent physical accomodations in several public hospitals in the mid-1800s. In part this was a legacy of the almshouse connection. But as the century moved on, scandals prodded politicians (as did visits by socialite women's groups) to do something about the deplorable conditions in which patients were immersed. Eventually almshouse practices dwindled as public hospitals set up private rooms and admitted paying patients, as at Boston City Hospital. As nursing emerged into a profession, trained and caring nurses replaced the wretches or prostitutes who once provided care to the sick. Still, the taxpayers were willing to pay only for third-rate care for the indigent in city hospitals. The author persuasively argues that both administrators and politicians knew this but avoided confronting it. Consequently nurses, doctors, administrators, and others in public hospitals did the best they could with what they had. That "best" became better as time moved on because of the other non-fiscally dependent changes that were taking place. Professional nurses and administrators, structured programs for educating doctors and nurses, and the emergence of loosely held confederations of doctors within public hospitals, coupled with the application of medical advances made these hospitals run, as the author so well puts it, in spite of the handicaps.

The third and largest section of *City Hospitals*, called "The Academic Period," deals with the history of public hospitals during the half-century between 1910 and 1960. During this time urban growth, coupled with the growth of indigent urban populations and advances in medical technology led to an enormous increase in the number and size of public hospitals.

The author deals with this complex period and the huge task of analyzing mountains of historical data and information by treating the problem in three chapters. In the first of these, "Cities and Their Hospitals: An Uneasy Equilibrium," he delves into the effect of demographic growth and demand on public hospitals, their financing and governance, and he explains how cities coped with the never-ending problem of finding enough money to support these institutions. The same era also witnessed the first attempts to impose standards of performance on hospitals. During the First World War the American College of Surgeons surveyed 692 hospitals with one hundred or more beds; only 13 percent met the standards. Eventually many hospitals improved their services, not only because of public pressure generated by the press, but also because professional staffs and administrators demanded improvements. By taking several public hospitals, such as Cook County, Boston City, and Baltimore City, and discussing them separately, Dr. Dowling shows both their similarities and their differences. One characteristic that they all had in common was their ability to break free from political domination, although politics did not lose all its influence. They also improved their standards and actively sought accreditation; by the 1920s this was vital to the recruitment of nurses, physicians, and administrators.

In his chapter titled "The Development of University Services," the author deals with the establishment of associations between university medical schools and public hospitals. In some instances, such as Bellevue Hospital in New York City, more than one medical school was affiliated with a public hospital. Depending on circumstances, this arrangement led either to healthy rivalry or to destructive competition. Universities saw an opportunity for access to large populations of patients, who were needed in teaching, and public hospitals hoped for improvement in the quality of care, in image, and in the ability to recruit personnel and financial support. Despite the apparent advantages, negotiations were often protracted and difficult because of conflicting interests. Nevertheless these associations grew and still exist in many places. The author describes in great detail the way in which this wedding of public hospital and medical school took place in specific institutions; in addition he furnishes a thorough overview of the subject.

In the final chapter of this section, "Medical Care: Running to Keep Up," Dowling explains that these institutions, despite their upgrading, remained mired in isolation from the mainstream of medical care because of their earlier histories and because they had become accustomed to such isolation. Underfunded, held together by dedicated staffs of physicians, nurses, and support personnel, the public hospitals barely survived through the 1950s. But the civil rights movement, the student revolt, and the protest movement against the Viet Nam War had created an environment favorable for revolt. By the mid-1960s public hospital personnel were no longer content merely to muddle through as their hospitals grew inefficient and outmoded, and literally crumbled. The protests that erupted were examples of the broader national protest movement, often carried into the hospitals by veteran college protestors who were now house officers. Residents would strike for one set of issues, attending physicians for another, and nursing and ancillary staff for still another, while communities demanded a greater say in how "their" hospitals were run. Public hospitals, like so many other segments of American society, were also swept up in the tidal wave of protest. Many of the complaints were legitimate and focused on long-neglected issues. Yet these issues often resisted the quick solutions demanded by the protestors.

The dust eventually settled. In New York City a Health and Hospitals Corporation was established as a public benefit corporation in order to operate the city's eighteen municipal hospitals. Earlier the New York Department of Hospitals had launched a massive program of affiliation whereby each municipal hospital became linked to either a medical school or a voluntary hospital. The aim was to improve the quality of care in the municipal hospitals and to pool resources. Dowling rightly states that, because of the advent of Medicare and Medicaid, which greatly reduced the number of indigents, the results are difficult to evaluate. As Lowell Bellin, a former Chairman of the Board of Directors of the New York City Health and Hospitals Corporation points out, patients on Medicaid voted with their feet. They now went to the voluntary hospitals, where they often recognized that the quality of care was better.

Changes in governance, such as the establishment of a public benefit corporation in New York City, did not solve the problems as many had hoped. The extension of third-party coverage to people who had never had it before, plus expansion of many voluntary hospitals, resulted in

low occupancy rates as patients abandoned public institutions in favor of voluntary institutions. In New York City and elsewhere this change combined with a decline in population caused the closure of several municipal hospitals. Moves of this kind are never popular politically. The resultant strident protests alleged denial of access to medical care for the poor, but in reality the hidden reasons often were loss of jobs, career opportunities, power bases, and real personal commitment and loyalty to a given hospital.

Attempts to rationalize and regionalize hospital care through the Health Systems Agencies (HSA) in the 1970s were partly successful. But the HSAs had little effect on the public hospitals, which after a period of decline in demands from clients, were now being set upon by new waves of immigrants—often undocumented aliens—for whom these were the only hospitals where care could be obtained.

The need for public hospitals still exists because our cities still contain vast numbers of people who either have no form of third-party coverage or who are "working poor," too rich to receive Medicaid but too poor to pay hospital bills. Public hospitals are the only hospitals of resort for these persons. And they are the hospitals of last resort for many patients not wanted by the voluntary hospitals. Shaken by revolt in the 1960s and worn down by declining demand in the 1970s, these institutions still survive and will continue to do so for some time to come. Propelled by devoted and dedicated staffs and working with inadequate budgets to meet newer challenges and demands, they must cope with state and local governments, political realities, and rivalries among themselves and the voluntaries.

Understandably and wisely the author does not prognosticate the future of these hospitals. No one can. But he does make a convincing case for their immediate survival, which depends on closer links to their communities in providing continuous therapeutic and preventive care.

City Hospitals is a splendid book, written by a scholarly and compassionate physician who provides a thoughtful and insightful overview of a vast and complex subject. In concluding with the phrase "Does anybody care?" he sums up the basic problem of the public hospitals. I would answer that people do care about these hospitals, but not enough.

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ESSAY-REVIEW

BUIKSTRA, JANE E., ed. *Prehistoric Tuberculosis in the Americas*. (Evanston, Ill.: Northwestern University Archeological Program, 1981). 182 pages. Price $14.50, paperback.

Reviewed by WILLIAM D. SHARPE

TO oversimplify, conventional wisdom holds that Columbus's sailors brought tuberculosis to the Americas, in revenge for which native Americans infected Columbus's sailors with syphilis, an epidemic of which they started on their return to Europe. Like most oversimplifications, this is mainly inaccurate but does contain a tangential element of truth. The question has been debated for at least three centuries, and the symposium under review adds eleven papers of very uneven quality to this debate. The issue (p. 1) is simple: "Was there tuberculosis in the Americas prior to 1492?"

At the outset, it must be confessed that this collection of papers required much heavier editing than it got, and that a few of the papers are so badly written that they are difficult to understand. Pages 70 ff., for example, refer to *cocci* when the context seems to require *coccidioides*. Or doesn't the author know the difference? In any case, this is unacceptable microbiology, writing, and editing. The editor, on page 1, seems to prefer *medical doctor* to *physician*, and on page 2, confuses the verb *forbear* with the noun *forebearer*. Perhaps pedantically, I object to the misuse of *pathology* (*passim*) where *lesion* would be correct. The symposium is not easy to read.

For serious discussions of historical problems, some papers seem to lack much historical perspective. For example, on page 2, Dr. Buikstra suggests that lung cancer (primary? metastatic?) may have, in the past, been confused with pulmonary tuberculosis when in fact, except for the Schneeberg and Joachimstal miners, primary lung cancer was a pathologic curiosity before cigarette smoking became popular during World War I and indeed, judging by his *De Sedibus et Causis Morborum*, the diligent and observant Morgagni himself does not seem to have encountered a case. One of the most exciting things that autopsies of mummies has turned up is exactly the relative infrequency of malignant tumors among them. Dr. Daniel (pp. 36–37) certainly strains our credulity when he extrapolates the ratio between pulmonary and extrapulmonary

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tuberculosis in the United States during the 1970s to pre-Columbian times, though Widmer and Perzigian (p. 100) make the important point that "the specific nature and course of host-parasite relationships, as revealed and understood in modern clinical and epidemiological studies, may not be exactly the same as in the past."

The illustrations are clear, except for those on page 66, which might be almost anything. Figure 6 on page 78 has a caption that sets a new standard for waffling, and although ape flat bones are subject to quite unexplained small round holes, my own differential diagnosis would have to suggest an ordinary root abscess.

The paper by Allison, Gerszten, et al. (pp. 49–61), is a masterpiece. Eleven Chilean and Peruvian mummies are described. Two of them with ^{14}C dates of A.D. 290 had cavitary pulmonary lesions from the walls of which acid-fast bacilli were recovered. Of the other nine, a Ghon complex was present in three and Pott's disease in four. Certainly two and perhaps nine of these pre-Columbian mummies seem to have diagnoses of tuberculosis about as solidly established as paleopathologic techniques will permit.

But it is curious that of the eleven parts of this symposium, only one cites Arnold Rich's authoritative *Pathogenesis of Tuberculosis*[1] and none refers to E. R. N. Grigg's infuriating 1958 series, "The Arcana of Tuberculosis," in the old *American Review of Tuberculosis and Pulmonary Disease*.[2] The symposium met before C. J. Hackett's 1981 paper on postmortem bacterial and fungal attacks on human bones cautioned us that both ground water and soil contains organisms quite capable of attacking inhumed bones, and therefore capable of confusing postmortem appearances.[3]

Pre-Columbian clay pottery figures include hunchbacks and gibbous infants, and the *Jesuit Relations*, an underrated source of ethnologic lore that would probably be more cited if they presented a more flattering picture of Amerindians than they do, often refer to a high mortality from "wasting diseases" among American Indians when Europeans first encountered them. Hrdlicka, in 1909,[4] concluded that no pre-Columbian skeletal lesions could be attributed to tuberculosis, and this seems to have been the general opinion until Allison, Mendoza, and Pezzia in 1973 documented a case of tuberculosis in Pre-Columbian America by recovering acid-fast bacilli from an eight- or ten-year-old boy who died

about A.D. 700 from what seems to have been Pott's disease.[5] Other instances of pre-Columbian tuberculosis are documented by D. J. Ortner and W. G. J. Putschar.[6]

The answer seems to be that tuberculosis did, in fact, exist in the Americas before Columbus, and to forestall the inevitable suggestion that tuberculosis came over with some putative pre-Columbian European adventurers (Vikings? Brendan the Navigator?), A.D. 290 is pretty early. The issue seems to be about as well settled as it can be that tuberculosis in the Americas antedated Columbus. Why then is this symposium so generally unsatisfactory?

I suggest that few of the contributors, Allison's group excepted, really come to grips with just exactly how nonspecific the inflammatory changes in human tissues really are, or the extent to which hospital pathologists rely on clinical information (inevitably lacking for palaeopathologic material) when they attempt to interpret these changes. New bone formation is new bone formation, fibrosis is fibrosis, granulomas are granulomas, and a sinus is a sinus. Pathologists can usually tell benign from malignant tissue changes with considerable accuracy, and if they can't, they don't last very long, but to assign specific etiologies to any of the wide range of tissue changes associated with the various stages and kinds of inflammation typically requires much more information than gross or microscopic examination can by itself provide. Forensic pathologists are sometimes hard-pressed to decide whether bone fragments found buried in somebody's backyard or recovered from a burned building are human or animal in origin, and excessive confidence in the laboratory may not infrequently be shaken in the law courts. It is perhaps significant that debate over the pre-Columbian existence of tuberculosis in the Americas has been settled by the variety of skills and disciplines that Allison and his colleagues were able to apply to suggestive lesions (lung cavities, Pott's lesion) in a sympathetic laboratory of general pathology, where the acid-fast bacilli were identified. Exact characterization of these acid-fast bacilli would demand their culture. They *may* be saprophytes, but their most likely identification remains *Mycobacterium tuberculosis*.

The real lesson of this symposium may be that just as modern hospital tissue diagnosis demands the contributions of scientific disciplines other than morphology, palaeopathology must now call upon a far

wider variety of scientific disciplines than physical anthropology, anatomic pathology, and histology. The symposium disappoints us because its contributors have, for the greater part, not kept up with the state of diagnostic tissue pathology. When they do catch up, I think that we can look forward to some very exciting developments indeed.

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ESSAY-REVIEW

ROWLAND, BERYL, ed. and trans. *Medieval Woman's Guide to Health. The First English Gynecological Handbook.* Kent, Ohio: Kent State University Press, 1981. 192 pages, illustrated. Price $17.50.

Reviewed by LAWRENCE D. LONGO

AMONG the difficulties that confront the historian is the fact that the number of primary source materials diminishes the farther one probes into the past. For those who explore the conditions that existed before the invention of printing the problem is particularly severe. For contemporary readers whose knowledge of Latin or early English is small the availability of these sources is doubly impeded. The *Woman's Guide* thus is especially welcome.

During the early part of the fifteenth century, medical manuals were written in the vernacular by laymen for their nonprofessional brethren. The book under review is based on a vellum manuscript, Sloane 2463, a Middle English text of this genre, written by an unknown hand and preserved in the British Library. The treatise was to serve as a handbook for women.

The text, 57 pages with an equal number for the translation, consists of a series of chapters on various diseases and problems, such as disorders of bleeding (amenorrhea and menorrhagia), uterine prolapse, inflammations, childbirth and its complications (the diagnosis of pregnancy, acceleration of childbirth, expulsion of the fetus, abnormal presentations, and post-partum hemorrhage), with brief allusions to several other conditions. Most chapters give the presenting complaint, the symptoms, and an explanation of the problem. A section on remedies then follows. In many chapters it consists of a series of recipes, some of which have little to do with the presenting symptom. In some cases the author records a personal note such as "but to tell the truth, add half a pound of galbanum . . . instead of honey" to hasten childbirth. Not unexpectedly the author often stresses the need to rely on heavenly powers. For instance, with regard to excessive bleeding, "if these [medicines] are of no use, only God can cure" (p. 87), and "this experiment . . . greatly assists in childbirth, if God wills" (p. 123).

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The various remedies usually reflect the medical mind set of the times. Not surprisingly, details of many specific procedures such as correction of uterine prolapse (p. 101) and recto-vaginal fistula (p. 103) are lacking. The printed volume includes a dozen illustrations, mostly from later printed volumes. Unfortunately, several of these (pp. 5 and 40) have been reproduced as cartoons rather than as copies of the original drawings. In the introduction the author states that the "birth figures and the accompanying descriptions are the most remarkable feature of our manuscript." Unfortunately, rather than presenting these illustrations, she reproduces reproductions of little artistic merit.

The significance of this volume is that it is apparently the earliest Middle English text devoted to obstetrics and gynecology. The translation appears to have been carried out with skill, and is a useful contribution. The introduction is of particular value. It consists of a 54-page essay on medieval obstetrics and gynecology and on the role of women in the care of women. This essay contains a wealth of material. Also of great value is the list of references and annotations, which are, in general, excellent.

The *Medieval Woman's Guide* should be of great value to historians of medicine, sociology, and women's studies, regardless of whether they are especially interested in medieval gynecology.

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The Physician and Hospital Privileges

HAROLD L. HIRSH

HOSPITAL staff privileges have become critical to most physicians in this country. Hospitals invariably require membership on the staff as a prerequisite to the rendering of medical services by a physician to a hospitalized patient. Nowadays a physician who is not allowed to practice in a hospital is, for all intents and purposes, denied the opportunity to practice medicine. The structure of both the health care system and the law in this country is such that there are situations in which a physician can be denied wrongfully the right to practice his profession; he may have no way to remedy the situation other than redress by the courts. There are other instances in which available legal remedies were and are inadequate and provide no relief to the aggrieved physician.

In the last two decades the courts generally are recognizing the ominous character of the situation and have become sensitive to the omnipotence of hospitals in this area. To that end they have provided forums for disenfranchised physicians who were denied or deprived of staff appointments, and they have invoked appropriate remedies.

Corporate Liability

From the legal aspect, the danger to physicians has come about as a result of judicial decisions, particularly the imposition of "corporate liability."[1–7] In addition, there is Congressional and state legislation requiring hospitals to select and monitor physicians' activities properly. In some instances, hospitals have misunderstood their role in interpreting and implementing their legal duties. In other circumstances, because of their administrative zeal and greed, they have deliberately abused and oppressed physicians.

What is "corporate liability?" Corporate negligence is one aspect of the failure of those entrusted with the task of providing the accommodations and facilities necessary to carry out the purposes of the hospital corporation to follow the established standard of conduct to which the corporation should conform. It is a recently espoused theory and may be used by a patient to show that his injury was caused by a negligent act

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for which the hospital is liable. Under the theory of corporate liability or negligence, the issue is whether the hospital, as a corporate institution, has a direct duty to furnish, or at least arrange for, competent medical care by the attending physician despite the initial unilateral selection of the physician by the patient. In accepting a physician for privileges to practice in its facility, the hospital places a stamp of approval on him.

This is distinct from "corporation liability," which occurs when the hospital selects or retains incompetent employees, furnishes defective equipment or supplies, or fails in some other manner to meet the accepted standard of care, and such failure results in injury to an individual to whom the hospital owes a duty.

Recent cases[5–7] have elaborated on the duty of a hospital in selecting and regulating its medical staff. In the *Darling* case, the stage was set for, or at least dramatized in a revolutionary fashion, the modern judicial concept of the role of the hospital in medical care. Specifically, the hospital will be considered as a health care provider in supervising the competence of its visiting or attending staff physicians. The courts have held that it is the various committees and department heads acting for and on behalf of the hospital who are charged with fulfilling this duty; if they were negligent in not taking any action against an "incompetent" physician or recommending to the board of trustees that action be taken, the hospital would be considered negligent.

The ramifications of the *Darling* case were seen immediately. An Illinois appeals court imposed liability on a hospital for the imprudent or careless selection of the members of its attending staff.[8] The Washington Supreme Court held a hospital negligent as a matter of law for the failure to adhere to the standard of good practice in the selection of attending staff physicians, as embodied in its own rules.[9]

In a California case,[10] in which the physician defendant for nine years made a practice of performing unnecessary surgery—and performing it badly, simply to line his pockets—the judge opined that the hospital had a duty to protect its patients from malpractice by members of its medical staff when it knew or should have known that malpractice was likely to be committed. Although the hospital had no actual knowledge of the physician's propensity to commit malpractice, it was negligent in not knowing because it did not have a system for acquiring knowledge; it did not use properly the knowledge available to it; it failed to investigate other cases which would have given it knowledge; and it could not excuse itself on the ground that its medical staff did not inform it.

With great reluctance the judge reached the conclusion that the hospital was liable; he was certain that the hospital administration had done everything within its power to run a proper institution. But the members of the board, like every hospital governing board, are corporately responsible for the conduct of their medical staff. The court held that it did not anticipate that the hospital would suffer financially, because the ultimate responsibility rests on the physician. He who by the improper exercise of a legal power intentionally creates liability against another is liable to him for the creation of that liability. The hospital could recoup its losses from the offending physician (indemnification). The hospital was a culprit, but it was also a victim.

The courts have almost always accepted the doctrine of corporate liability when confronted with the question of the hospital's responsibility for the proper selection and monitoring of its attending physicians. However, two jurisdictions have rejected the principle and have continued the traditional approach.[11,12]

The courts have embellished the doctrine of corporate liability. Because of the interrelation of the medical staff and the hospital, two courts have held that the medical staff of the hospital had the duty to investigate both new and renewal applicants and to recommend only capable physicians for membership in the staff. The courts have held specifically that the hospital has an obligation to check the references submitted in connection with application for staff membership.[5,12] The Michigan appellate court has held that a hospital could be liable for failure to develop guidelines for consultations.[13] The Nevada Supreme Court decided that a hospital has the responsibility for reviewing and evaluating the quality of care rendered at the hospital.[14] And a Missouri court decreed that a hospital has an obligation to perform diagnostic testing preoperatively to prevent use of its facilities for contraindicated surgery.[15] In all of these cases the hospital had rightfully delegated the responsibility to the medical staff and its own administrative staff.

This interpretation of liability by hospitals in such situations reflects a strong tendency of the courts to place liability on the institution when the affiliated professional commits a negligent act while engaged in performing services on the hospital's premises. Because liability could not be imposed under the doctrines of agency, respondent superior, and vicarious liability, since the health care providers were independent contractors, the courts have evolved the concept of corporate liability

in order to give maximum protection to the patient. Hospital personnel are best equipped to detect, identify, and expose bad physicians.

The law has followed changing patterns in the provision of health care; thus liability, like medical practice, has become institutionalized. If a hospital knows or should have known that one of its patients is likely to be a victim of malpractice by an independent practitioner on its staff, it is liable on the basis of its corporate liability.

The courts have held that the hospital, by virtue of its custody of the patient, owes him a duty of care. This duty includes the obligation to protect him from acts of malpractice by his own independently retained physician who is a member of the hospital's staff, if the hospital knows, or has reason to know, or should have known, that such acts were likely to occur.[1–10] Hospital liability is not limited to cases of actual knowledge of carelessness, but also includes cases in which the hospital should have known by appropriate diligence and vigilence, whose conduct was considered to the reckless disregard in this situation.[5]

The courts have held that the hospital is not immune from liability merely because it has conformed to the standards of the industry or because it is required to function with a self-governing medical staff. Although the staff may be self-governing, it functions only under the authority and sanction of the board of trustees. The courts have ignored the recommended or established guidelines or standards when these were inadequate or inappropriate and they have imposed their own standards judicially.[10]

Franchisers or Concessionaires

The courts have extended the responsibility of hospitals for the physicians who practice within their walls. Physicians, with staff privileges, who render a variety of services, such as anesthesiology, pathology, cardiology, dialysis, radiology, and the emergency room, under an exclusive contract, had always been considered independent contractors. Except for the state of Georgia,[16] this is no longer true. In state after state the courts have held these practitioners to be "apparent" or "ostensible" agents of the hospital for whom the hospital will be liable under the doctrine of agency—vicarious liability and respondent superior—when they are negligent.[17]

Who is in Charge?

The standards of the Joint Commission on Accreditation of Hospitals [JCHA][18] specify that the medical staff is responsible to the hospital's governing board for the quality of medical care provided to patients in the hospital and for the professional practices of medical-staff members. According to the courts, the hospital is not required to appoint or retain on its medical staff any particular individual who has been nominated by a medical committee or by the medical staff. It must select its staff from the class of competent, worthy, and ethical physicians, and it is responsible for the total continuing conduct of those physicians. Despite these responsibilities a hospital may not be arbitrary or capricious regarding a physician's hospital privileges. These duties do not give the hospital a license to pursue inordinately the physician. The decided cases lead to the conclusion that hospitals are being held to a high standard of care, exemplified by the recent JCAH guidelines.[18]

Hospitals must be prepared to assume the burden of regulating and becoming closely involved—through a well-organized medical staff and committees as well as through a knowledgeable administration—in the maintenance of high-quality medical care, including the services of physicians not only in the hospital, but also outside the hospital when this reflects on the physician's competence.

These decisions should not be interpreted, however, as meaning that lay individuals in hospital administration are now called upon to control the clinical practice of medicine on a case-by-case basis. Clearly, the courts do not desire or require this; such lay control would be intolerable because only physicians can exercise the best kind of clinical judgment. Rather, the courts simply considered the hospital to be a single organization composed of administration and medical staff and sharing jointly the responsibility for standards of care. Administration, represented by the board of trustees and the lay administrator, is now called upon to promote and to stimulate the medical staff of the institution to be adequately organized for the purpose of reviewing the professional qualifications and performance of each individual staff physician.

Physicians appointed to the hospital staff must have an established procedure for consultation, and lines of communications between clinical-practice personnel and lay administration must be open. The medical staff is held accountable to the corporate organization for

standards of medical care. The chief of the staff of physicians must be a dedicated person, essentially institutionally oriented, and devoted to implementation of standards promulgated by responsible private and public agencies that accredit and license hospitals in the public interest. In other words, fragmentation, departmentalization, and individualism within the walls of the hospital must be reduced insofar as is humanly possible and consistent with good patient care. The obligation of the hospital through an organized medical staff to exercise control on standards of practice has been outlined by the courts. In reviewing the cases that present issues of hospital negligence for failure to scrutinize the quality of care rendered by members of the medical staff, the trend is clear. The organized medical staff acts on behalf of the hospital; its omissions become those of the hospital.

Relation Between the Hospital and its Medical Staff

As to the protection and preservation of the independence of the medical staff, it has been held by a *few* courts and by JCAH that only the medical staff may promulgate and adopt the rules, regulations, and by-laws under which it operates.[19] The hospital board of trustees is restricted to approving these by-laws. Any insoluble conflicts are properly brought before the courts. These courts have also held that the by-laws of the hospital's medical staff, once adopted by the board of trustees and the medical staff, became a contract that can be amended only by agreement of both parties. Obviously, the courts would intervene if this could not be worked out by the parties.

Most courts believe that these are poor decisions, because they do not recognize the true nature and purpose of the medical-staff organization. The medical staff is the agent of the board of trustees of the hospital and has as its purpose the furtherance of the hospital's interests. It is part of the hospital's corporate form and not a separate unincorporated association. The delegation by the hospital of its essential corporate responsibilities to a separate association, they believe, may be illegal under the doctrine of *ultra vires*. In truth, hospital boards do have the authority to delegate functions to their agents, including the medical staff as a whole or by committee, as long as is reasonable; they have the ultimate control, and may not abandon their duties, obligations, or responsibility.[5–7,10]

Although it would appear on the surface that the minority judicial rulings and JCAH rules regarding the regulation of the process of the

formulation, adoption, approval, and implementation of by-laws of the medical staff is totally inconsistent with the majority decisions, the latter regard the board of trustees as responsible for the over-all activities of the medical staff. However, this would be an inaccurate conclusion. Under both philosophies, the court decisions and JCAH regulations place the responsibility for the development and formulation of the medical-staff rules, regulations, and by-laws independently on the medical staff, through appropriate committees, with their adoption by the medical staff before submission to the board of trustees. The board still has the final and ultimate responsibility for their review and approval under either approach.

Clearly, the by-laws must be consistent with accepted hospital practices and legal requirements. These by-laws cannot be unilaterally, arbitrarily, and capriciously created and imposed on the medical staff by the board of trustees. Implicit in this required arrangement is that the medical staff and board of trustees must appropriately compromise and resolve their differences. Otherwise the courts will accomplish this for the parties, if requested. Implementation of the by-laws is the responsibility of the medical staff under the auspices of the board of trustees, the board being duty-bound to oversee and actively and affirmatively intervene if proper implementation is not accomplished by the medical staff. This is a reasonable division of duties that properly utilizes the professional expertness of the medical staff on medical matters and the administrative skills and responsibilities appropriate for the lay board.

Staff Appointments and Hospital Prerogatives

Hospitals are now required to evaluate and to monitor by regular review a physician's professional, physical, and mental competence, attitudes, and dedication, as well as his ability to get along with others in their institution and elsewhere, and not be disruptive. This becomes critical to a physician, who can now be denied hospital privileges for failure to maintain adequate records in a timely fashion, or inability to get along with his associates in health care.[20,21] However, a physician who is not disruptive but merely controversial cannot be excluded.[22]

The courts have upheld a hospital's right to require a physician applicant as a condition for privileges to document not only his experience, training, and demonstrated competence, but his adherence to the ethics of his profession, a good reputation, and his ability to work with others, with sufficient adequacy to assure the medical staff and

governing body that any patient treated by him in the hospital would receive a high quality of medical care. A physician must be good in every way—and every day.

New and annual applications for renewals of privilege must be scrutinized and evaluated carefully. This process has become more rigorous in recent years. JCAH accreditation regulations require renewal candidates to produce relevant records, and to undergo a physical examination and a personal interview or discussion with the credentials committee. In addition, the hospital must continually monitor less tangible qualities, such as dedication and reliability, in each member of its attending staff.

In the past, once a physician was granted hospital privileges they were retained for life. There were few exceptions. Privileges were rarely suspended or revoked, and then only when the physician was convicted of a crime or committed highly unethical or immoral professional conduct. This is no longer true.

Procedures and Methodology—How Should It Be Done?

Merely recording the deficiencies of a physician on the chart is not enough.[1] The staff chiefs and administration must be notified. Credential committees and other appropriate medical staff review committees, as well as the administration, must review these reports. They must take affirmative action against delinquent, deficient, errant, or sick physicians. As has been noted, a New Jersey court held that a whole attending medical staff could be sued by a patient who was injured by an incompetent physician about whom the staff knew but did nothing.[10]

Recent decisions hold that a board of trustees may pass by-laws requiring physicians to carry adequate malpractice insurance as a condition for staff privileges because the governing board must maintain the fiscal integrity of the hospital for the benefit of the patients.[23,24]

The Disruptive Physician

Courts generally are now imposing the proposition that a physician's personality, including cooperation with the hospital administration and staff, as it affects the standard of care provided by the hospital, is one of the criteria to be taken into account in the granting or renewal of staff privileges.[26–33] Thus, it is within their rights to consider personality factors in its decisions as to selection, appointment, and removal.

A disruptive physician need not be accorded privileges. Who is the disruptive physician? There are no absolute criteria, but usually he is a physician who is antagonistic, hostile, argumentative, demoralizing, and uncooperative with the administrative and professional staffs and even his own patients—in truth, a bad actor. On the other hand, a physician who is merely colorful or unpopular may not be denied.[22]

Courts have upheld boards of trustees who have terminated disruptive as well as incompetent physicians. The rationale here is that upsetting normal hospital function is not conducive to optimum care of patients, which is the board's responsibility to maintain. The hospital is no longer merely the physician's workshop; he shares the care of the patient. Since the law now deems the hospital a health care provider through the board of trustees, employees, and agents, they are primarily responsible for the quality of care. To fulfill this duty, it is essential that they make careful and proper selections of those who will have privileges at their institution. For even though patients select their own physicians independently, the hospital, by granting privileges, will in effect endorse the attending physician as competent, capable, and able. It is a seal of approval. Once the patient enters the hospital, the responsibility extends beyond the providing of room, board, equipment, and so on. It is a shared responsibility of the hospital with the attending physician.

Review Procedures

The past decade had seen a sharp increase in lawsuits involving court review of the denial of attending staff privileges. The circumstances from which these controversies arise are varied, running from civil rights challenges and denial of due process, through antitrust suits, from local to federal courts, from single physician or patient claims to class actions. Regardless of the disparity of the legal scenario, these cases may be reduced to a common denominator, that is, dissatisfaction with the review procedures or process. This dissatisfaction is shared by physician, patient, and institution alike, regardless of the perspective from which the dissatisfaction arises.

A review of these cases reveals that hospital review procedures have sometimes failed or are inadequate. They are not rigorous enough to provide adequate guarantees of quality to hospital patients. Equally clear, however, is the fact that, as applied, all too frequently the typical review procedure is used to exclude physicians for other than professional

considerations. However, the hospital is frequently caught in the middle—sued by patients because of iatrogenic or negligent injuries caused by allegedly underqualified physicians, and, on the other hand, sued by physicians because of staff exclusion that is alleged to be procedurally or substantively unconstitutional.

What is obvious from this three-sided tug of war is the need for tightening-up of staff privilege review procedures. An analysis of these cases reveals that in order to protect patients adequately, this procedure should apply current national standards of care, should be reviewed and updated, if necessary, regularly and periodically. This should be thorough and rigorous, and should include initial denial, immediate temporary suspension, or permanent withdrawal of privileges. In addition, the scope of review should extend beyond the institution and should include all aspects of the physician's activities.

To protect the physician, the review must have procedural and substantive safeguards. It must be formalized, publicized, and accepted in advance, and it should be carried out by a committee of peers and of fellow members of the physician's speciality. Some authorities, who are in the minority, suggest that it should be carried out, on at least some level, outside the hospital by a group beyond the control of institutional power politics. From the point of view of the hospital, the review process should serve both the physician's and patient's interest impartially, thereby protecting the institution from liability exposure on either account. It may be in the best interests of all parties that the review include all the above and that an impartial external appeals process other than the courts be available for review of privilege decisions made within the institution itself.

As has been noted, the cases also demonstrate that the judiciary has attempted successfully to balance and protect the interests of the physician to practice his chosen profession freely, of the public to have access to high-quality health care, and of the hospital authorities to administer its facilities efficiently and autonomously. They show that upon initial application, a duly qualified physician can almost always obtain staff privileges at a hospital, and that at this threshold stage, the burden rests upon the hospital to show medically relevant reasons for a denial, and similarly for reduction or suspension of privileges.

Role of the Courts

Judicial review of institutional staff-privilege decisions is limited in scope, however. First, motivation is not usually considered a proper area of inquiry. Second, and more significant, judicial review in privilege cases falls under the more general classification of review of administrative action, with the usual traditional limits to investigation of the procedure only. Substance and facts, medical rationale and background, are usually not included in the court's evaluation. In essence, the courts have been concerned primarily with determining whether procedural due process was afforded the physician, and whether there was equal protection under the Constitution and civil rights laws. The latter may include a determination as to whether any state action was involved in violation of the Fourteenth Amendment. This means that the government, state or federal, was involved in the decision. Receipt of governmental funds alone does not invoke state action.

Until recently courts sought only to determine whether there were established procedures to ensure that the decisions were not unreasonable, arbitrary, capricious, and discriminatory, and whether they were properly utilized. A few courts are also reviewing whether there was defective substantive due process and whether the decision was supported by the evidence. The punishment must be the crime.[34,35]

The courts had generally not been willing to interfere with the decisions of the hospital boards and to substitute their judgment for that of the board members. This is no longer viable; courts are now beginning to consider hospital privileges as a fundamental vested right, rather than a privilege bestowed by the hospital administration.

Most of the recent litigation dealing with medical staff privileges has not involved violations of the common or statutory law, but instead allegations that arbitrary, capricious, and otherwise discriminatory conduct by the hospital violated the physician's due process and equal protection rights. Of late physicians have complained of tortuous interference with their business relationships with their patients. The law giveth and the law taketh; in response to these transgressions the courts have intervened on the physician's behalf to protect his status in the hospital. The hospital privileges of physicians now walk a two-way legal street.

Due Process

What is meant by due process as it applies to the hospital privileges of physicians? The law requires that the governing board of a hospital must adhere to a minimum of due process in its appointment of physicians to its staff and thus cannot engage in the arbitrary and capricious or malicious exercise of its discretion. While this type of reasoning originally applied to public hospitals only, it is now applied to non-profit private hospitals. Private hospitals, for the most part, continue to escape judicial scrutiny in this area. Minimal considerations of due process were applied to instances involving the withdrawal or reduction of staff privileges requiring that an adequate hearing be afforded the affected physician. The fiduciary obligation of the hospital to the public and physician requires a fair procedure in staff membership situations.

A recent case in California undoubtedly heralds a new trend in judicial consideration of hospital staff privileges for physicians.[34] The California Supreme Court found that the proceedings at the administrative level in repealing the physician's privileges were conducted in a manner consistent with the minimal requisites of fair procedure (procedural due process) demanded by established common-law principles. However, the court held that because the decision of the hospital substantially affected a fundamental right of the physician, it was incumbent upon the trial court, in determining whether an abuse of discretion had occurred, to exercise its independent judgment as to the facts in order to determine whether the findings of the administrative body were supported by the weight of the evidence. Because the trial court failed to do so, the judgment was reversed and remanded to the lower court for retrial in the light of the Supreme Court's admonition. In other words, not only must the trial court inquire as to procedural due process by the hospital, but also as to whether the facts support the conclusion—substantive due process.

This case affirms the principle affording, even guaranteeing, complete due process to the attending physician in his quest for hospital privileges. This is an absolute necessity for the practicing physician.

More recently the courts had indicated that due process includes the physician's right of access to all pertinent materials utilized by the hospital during the process as well as participation of a lawyer during the proceedings.[15]

Economic Conspiratorial Discrimination

The courts usually provide adequate remedies where there is discriminatory or arbitrary treatment of a physician in staff appointments. Judicial relief, however, had not been obtainable in other situations where the harm to the physician, although as devastating, is of a more subtle nature and cannot be classified as capricious. These cases often involve situations where, almost always for personal economic reasons, physicians were excluded without any opposition from, or even with tacit approval of, the governing board of the hospital or the administrator; they conspired to prevent a physician from practicing in the hospital. The conspiracy is usually cloaked in what appear to be legitimate circumstances. These cases usually fall into one of two categories: the conspiracy results in the denial or withdrawal of hospital staff privileges for the physician, or the conspiracy effectively deprives him of the opportunity to practice at the hospital by limiting available beds for admission or operating room space and time.

Unfair Business Practices Legislation—Antitrust Laws

In these circumstances, physicians have attempted to secure relief by invoking federal or state statutory protection proscribing unfair business practices. Under these laws it is illegal for individuals or groups to enter into a collusion or conspire to prevent others from carrying on similar business competitively.

In the past physicians had failed in these actions.[36–39] The courts usually relied on two theories in denying relief based on a claim of conspiracy of unfair business practices. They have held that the medical profession is not considered a business or trade within the usual statutory meaning of the term. Since the statutes were designed to redress an economic injury to the general public, a private individual is precluded from obtaining relief absent a showing of injury to the public in general. In light of the recent Supreme Court decisions which emphasized the trade or business aspects of the learned professions, including medicine, the theory in that the medical profession and its practice is not a business is no viable argument. There is no exemption from federal antitrust laws for the learned professions.[40–43]

Voluntary non-profit hospitals can no longer afford to rely on protection from suits under federal antitrust laws. Under the 1974 labor relations law, Congress held non-profit hospitals to be sufficiently

involved in interstate commerce to come under federal scrutiny and control.[44] The federal statutes also require a showing of a substantial impact upon interstate commerce. Recently, the Supreme Court held that the local non-profit hospital business sufficiently affects interstate commerce to place hospitals within the jurisdictional reach of the federal antitrust laws.

Yet, recovery under these state and federal statutory schemes still requires an injury to the public in general. The physician, whose injury is largely a personal one in such a situation, will find it difficult to overcome these barriers.[46–48]

It appears, however, that the courts will accept the premise that not only the physician but his patients also suffer by his deprivation of the use of hospital facilities. Do they constitute the necessary injured general public? Two Michigan federal court decisions stated that they do.[49,50] In these cases the Michigan federal courts ruled that a physician had standing to sue a hospital for violation of the federal antitrust laws for restraint of trade in excluding him from staff membership if he could prove that a significant number of his patients receive Medicare or Medicaid benefits and reimbursement from out-of-state insurance companies, despite the fact that both his and the hospital's patients came almost exclusively from a certain area of Michigan. The use of the mails to submit bills and receive reimbursement was adequate nexus to invoke the interstate commerce requirement for federal jurisdiction.

These recent decisions have expanded the scope of antitrust actions in the delivery of health care generally. A court recently ruled that a hospital's medical staff may not assert immunity defenses under the antitrust laws for various activities that were alleged to have constituted antitrust violations, interfering with the functioning of an abortion clinic.[51]

A Blue Cross-Blue Shield plan in Texas was held to be subject to Sherman antitrust violations in giving preferential reimbursement to subscribers who filled prescriptions in pharmacies which were contractual providers of Blue Cross-Blue Shield as compared to non-contractual pharmacies.[52] A federal court in Massachusetts held similarly in a case involving reimbursement to physicians by Massachusetts Blue Cross-Blue Shield.[53] This despite the legal status of this Plan, it having been created by the state legislature.

Civil Conspiracy

Civil conspiracy is defined as a combination of two or more persons to accomplish an unlawful purpose by concerted action, or to accomplish some purpose not in itself unlawful but by unlawful means. To that end, even without resort to statutory aid, the physician who is injured by a conspiracy to deprive him of his right to practice his profession is able to seek relief under the common law principle of civil conspiracy. Recovery under this theory is often difficult to obtain, primarily because it is necessary for the plaintiff to show that the defendants actually entered into a conspirative agreement or combination among themselves. In fact, this requirement has often proven to be the roadblock to attempts by physicians to seek recovery under a civil conspiracy charge or claim.[54,55]

Faced with the situation of a legal wrong inflicted on a physician which would otherwise remain unremedied, the state courts have begun to recognize the need for judicial relief, and are beginning to invoke the doctrine of civil conspiracy.[56,57] The evolution of this concept undoubtedly was assisted by the recognition by the courts that health care professionals and deliverers of health services were for these purposes involved in a business or trade as well as a profession.

Now, the courts say that everyone has the right to establish, engage in, and conduct a lawful profession (business).[56,57] Therefore, they are entitled to the protection of an organized society through its courts whenever that right is unlawfully violated. An actionable wrong is established against anyone who is said to have interfered intentionally with that right without justifiable cause or excuse. It is, therefore, an actionable wrong for two or more persons to conspire willfully and maliciously to injure and damage another in the conduct of a lawful business or profession. That includes the deprivation of hospital privileges, or the inability to practice because of the unlawful withholding of necessary medical assistance.

Under recent judicial rulings, if the physician plaintiff is able to prove that the defendants did act in concert to injure him, the civil conspiracy charge is a broad enough theory to encompass a variety of wrongs actionable at common law. In a California case the court stated that a cause of action was valid for common law restraint of trade where it was shown that the defendants, members of the governing board of a hospital and various staff physicians, entered into a conspiracy to interfere intentionally with the plaintiff-osteopath's business by denying him staff privileges.[56] Likewise, in a Missouri case the court employed a

civil conspiracy theory to uphold a complaint of interference with the contractual rights between plaintiff and his patients.[57] The physician was able to prove that several physicians and the hospital's governing board conspired to prevent him from acquiring membership on the hospital staff.

The flexibility of the legal theory of civil conspiracy in hospital staff cases is demonstrated in a recent Florida case.[58] The surgeon-plaintiff brought suit against a hospital and all the staff anesthesiologists; he alleged a conspiracy to refuse to provide him anesthesiological services. This resulted in his financial ruin. The court recognized the dilemma of the surgeon and certified the civil conspiracy charge as a valid theory of recovery. It emphasized that civil conspiracy may entitle an individual to relief by virtue of the defendants' concerted action. Even though an individual anesthesiologist has the legitimate right to refuse to render his services to a surgeon, where all the anesthesiologists of a hospital agree to refuse their services to a competent staff surgeon, this conduct amounts to an effective deprivation of the surgeon's practice at the hospital. This gives rise to an independent wrong under the concept of civil conspiracy. The court's reasoning enhances the ability of an aggrieved physician to recover under a civil conspiracy theory. It is the product of a court sensitive to the dilemma of a troubled physician whose injury is subtle and the product of action which seems legitimate, but is nonetheless intentional and devastating. It recognizes the pivotal economic nature of a physician's hospital practice.

Civil Rights Act

In the last decade the courts have had to become sensitive to civil rights and have provided forums for disenfranchised physicians who have been illegally discriminated against and have been denied or lost staff appointments. One court had come to the aid of an aggrieved physician by holding that any hospital which receives federal funds under the Hill-Burton, Medicare, or similar arrangement or legislation was involved in state action and on that basis alone could not discriminate because of race, color, or national origin in its medical staff appointments under the Civil Rights Act of 1963.[59–61] Now this court has joined other courts that have invoked the civil rights law to protect a physician who was discriminated against, but not on the basis of state action even though the hospital received governmental funds.[62–66] Most courts have

been willing to invoke this protection for physicians only in public, not in private hospitals.[63-68] Fortunately this problem is rarely encountered in the legal literature nowadays.

Exclusive Contract—Closed Staffs—Control of Services

Hospitals' decisions to enter into exclusive contracts for some medical services by granting exclusive privileges to only one or a few physicians have been upheld by the courts as good faith attempts to insure medical care of competent quality.[69-86] Antitrust laws have been held not to have been violated by such contracts granting exclusive rights to practice a medical specialty, such as cardiology, anesthesiology, pathology, radiology, emergency medicine, and dialysis, when the contracts were not unreasonable even though they excluded competent, capable specialists who had rendered the care previously.

Further, a hospital's governing board has the power to require the use of the hospital diagnostic equipment rather than the equipment of outside facilities.[94]

A recent decision by the federal Fifth Circuit Court of Appeals, and now accepted by the United States Supreme Court for review, has held that an exclusive contract to a group of anesthesiologists, which effectively excluded an anesthesiologist from practice in that geographic area, was illegal and violative of the federal antitrust laws.[87]

A hospital may close the staff and restrict privileges if the hospital services would be overtaxed.[88-90] It must however keep excluded physicians on a waiting list and review its statistics periodically and regularly to be certain that the crowding persists to justify continuation of the closed-staff policy if it is acting according to hospital census standards.

Further, in the interest of high-quality care, a hospital's governing board has the power to require consultation even of a specialist.[91] An Ohio court has held that certification, or eligibility, or membership in the specialty association, or a minimum period of experience, may be required for granting major specialty (surgical) privileges in a hospital.[92] This was not considered unreasonable or arbitrary. However, the same was not true for a public hospital.[93]

A hospital will not be violative of federal antitrust or state unfair business practice laws if it enters into an agreement with another hospital to restrict certain services and obtain or retain others in order to avoid duplication of services and improve quality of care when it is

subject to a federal or state regulatory agency requirement. Absent this requirement, such a voluntary agreement would be suspect when viewed in light of federal antitrust and state unfair business practice acts. This kind of agreement would be legal if the hospital included community members in the planning and decision.

Epilogue

Hospital health care is a triangular arrangement between patient, physician, and hospital. It can become an illicit love-triangle. The courts have recognized that a physician without hospital privileges is like a fish without water. However, life need not always be unfair for the physician vis-a-vis his right to practice in the hospital. Now the courts will intervene because medical practice is now considered a business or trade as well as a profession, and hospitals do affect interstate commerce.

The law has imposed upon hospitals the duty of properly selecting and monitoring their attending physicians under the doctrine of corporate liability. On the other hand, it has also protected the practitioner by requiring the hospital to adhere to constitutional fair play and equal protection, to afford procedural and substantive due process, to comply with the civil rights laws, and to adhere to the federal and state antitrust and unfair-business-practice acts. Depending on the circumstances, these as well as relief under the common law doctrine of civil conspiracy may be available to physicians who are disenfranchised by hospitals in their capacity as members of the medical staff.

In order for the physician to maintain his hospital privileges, he is now required to be good in every way on an ongoing basis. The care of patients by physicians now is not only shared with but also has to be monitored continuously by the hospital through its staffs, and must be maintained optimally.

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Five Pupils of Benjamin Smith Barton: The Men and Their Minds*

JOSEPH EWAN

AUGUST WEISMANN gave us a memorable phrase: "continuity of the germ plasm." There is also another continuity: "of the seeds of the mind." At the University of Pennsylvania medical school there was a seedbed in the quarter century 1790 to 1815. A professor of materia medica and natural history planted seeds there for his classes and held the dibble. That professor was seen by some of his students as "a mixture of bumbling personal pretensiousness with scientific abilities amounting almost to genius. An excellent naturalist in both zoology and botany, he put materia medica on a broad scientific basis and awoke in many of his pupils a genuine love of natural history."[1] That professor was Benjamin Smith Barton. Of Barton's 123 pupils whose records I have tabulated, five have been chosen here to illustrate five different minds whose contributions were made in as many different fields. Among the 118 pupils we shall pass over are William P. C. Barton of Philadelphia, James Howell Bartram of Kingsessing, John Brereton of Washington, Daniel Drake of Ohio, David Hosack of New York, Eli Ives of Yale, Jared P. Kirtland of Ohio, James Macbride of South Carolina, Patrick K. Rogers of Virginia, and Thomas Russell of Arkansas.

The first of our five is William Darlington, a birthright Quaker, farm boy become physician, congressman, banker, botanist, and author. He was Chester County's most celebrated native son. "Nestor of American Botany" was Asa Gray's term for him. Barton's botanical lectures at the University of Pennsylvania fostered Darlington's abiding interest in plants. Darlington apprenticed himself to a prominent physician of Wilmington, then enrolled at the University for his degree. His lecture notes from Barton's classes are preserved at the University of Kansas. During those years at the University of Pennsylvania Barton's classes

1. George W. Corner, *Two Centuries of Medicine: A History of the School of Medicine, University of Pennsylvania* (Philadelphia: Lippincott, 1965), p. 45.

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visited William Bartram's garden, and Darlington was to write affectionately of Bartram in later years. I suggest that it was Barton who urged Darlington to sign as ship's surgeon on the East India merchantman, the *Bengal*, bound for Calcutta. On shore leave there he met William Roxburgh at the Royal Botanic Garden. Before going to India as superintendent of the botanic garden, Roxburgh had been corresponding with Professor Barton, a fellow student in medicine at the University of Edinburgh. Roxburgh wrote to Barton on May 1, 1807, that Darlington had arrived some three weeks earlier bearing presentation copies of Barton's two pamphlets on generation of the opossum. "Dr. Darlington is on the point of departure," wrote Roxburgh, "and has again called on me for what I might have ready for America. I take this favourable opportunity to send you the accompanying parcel of seeds, some of which I hope will produce ornamental plants."[2] Today we have among Barton's papers an unlabelled drawing of a bignoniaceous vine, which I suggest flowered in Philadelphia from the seeds that Darlington brought back from Calcutta for his mentor. Darlington also sent a portion of the seeds given him by Roxburgh to the Charleston Botanical Society, and another portion to Dr. Hosack for his infant Elgin Botanic Garden in New York City.

Like Peter Collinson, the Quaker botanical enthusiast and promoter of American introductions into England, Darlington in his later years took pleasure in corresponding, exchanging, and giving. For example, there are thirty-one letters at Kew written by him to W. J. Hooker from July 28, 1830, to January 25, 1862. Darlington gave copies of his *Flora Cestrica* to his colleagues. Always realistic and pragmatic, he insisted that "we must . . . learn to direct our efforts to the attainment of such portions of instruction as may be found practicable." Leaders of American science have acknowledged the critical role of the amateur. Darlington also recognized this. "I am convinced, that knowledge must ever remain more or less partially distributed." Again he spoke, "If the human mind were even capable of universal knowledge, the period allotted to human life is altogether too brief for its acquisition."

Maleness and femaleness in plants had to be reconfirmed over and over, and during the Enlightenment was a problem to be reckoned with. In America, where maize was native, the sexuality of plants was

2. Barton Papers, Delafield Collection, American Philosophical Society, Philadelphia. Characteristically, Darlington sent a copy of his 1837 edition of *Flora Cestrica* to Roxburgh, but Roxburgh had died twenty-two years earlier.

tested experimentally by James Logan—"a great and memorable name"—Acting Governor of Pennsylvania. In 1736, just before he took over government of the state, he tested the hypothesis that "male dust" was essential in the maturation of corn kernels. In September 1806 Darlington reported to Barton that he had demonstrated to his own satisfaction from corn he had tended "that the doctrine of the sexes of plants is correct," that "anther dust" must reach the stigma for the perfection of the ovule in the ovary.[3]

Darlington began *Florula Cestrica* when there were few catalogues of American plants "and those few far from being complete," he thought. The *Florula*, published in 1826, accounts for seven hundred thirty-five native or naturalized species and one hundred eighteen cultivated in farm and garden in the vicinity of West Chester.[4] Particularly lively reading is the section called "Observations," which chronicles such matters as folk remedies of Chester County and the economy of crop plants. For the social historian Darlington relates that cattail "hairs" for bedding are much inferior to straw or chaff from clean oats. For the historian he writes, "It is said the leaves [of New Jersey tea] were much used by the Whigs, during the American Revolution, as a substitute for the proscribed Tea of the English East-India Company: which circumstances alone, judging from the sensible properties of the plant, might be taken as pretty good evidence of their zeal in the cause!"

Darlington's explanations of botanical names are often pleasing: "Ambrosia: poetical name: the food of the Gods; but certainly indifferent food for mortals" (p. 101). "Orchis: whimsical Greek name; and more tolerable in Greek than in English" (p. 93). His interest in materia medica led him to write to Richard Harlan and express his pleasure that Harlan was investigating the efficacy of hawkweed, *Hieracium venustum*, for rattlesnake bite. "If I live till spring, I can furnish you with any quantity of it." Darlington then remarks that Schoepf had trusted every popular folk tale of our indigenous remedies, as for example, *Passiflora*

3. "Male dust" appears in James Logan, *Experiments and Considerations on the Generation of Plants*, trans. J[ohn] F[othergill] (London, 1747), p. 17. Darlington offered the account of his experiment to Zaccheus Collins for possible publication in the *Journal of the Academy of Natural Sciences of Philadelphia*, but it was not published. See Wm. Darlington to Z. Collins, April 26, 1819, Collins Correspondence, f. 259½, Academy of Natural Sciences, Philadelphia.

4. According to Charles Pickering, who counted them and noted the fact in his presentation copy of the *Florula* now in this author's library.

for epilepsy in dogs. But, says Darlington, we must not underestimate popular remedies.[5]

In the retrospect of nearly half a century Darlington wrote "there can be no doubt that [Prof. Barton] did more than any of his contemporaries, in diffusing a taste for the natural sciences, among the young men who then resorted to [the medical] school."[6]

My second pupil of Barton's, also of Chester County, was William Baldwin, who met Darlington in the winter of 1802–03 as a classmate in Dr. Todd's medical lectures. For Baldwin's lifetime—he died in 1819 on Long's expedition—Darlington was an admiring friend. Baldwin was ship's doctor on a Cantonese merchant vessel in 1805. On returning he enrolled in Barton's winter course in 1806, and was graduated M.D. on April 10, 1807. Baldwin was disappointed that "Dr. B"—as he referred to Barton—had neglected to include grasses and sedges in his course. Barton was induced, Baldwin said, to consider the investigation of the grasses "extremely difficult."[7] Baldwin reported that he gave his Chinese botanical specimens to Barton, and "a great many others, adding that they are *safe* in the hands of Dr. Barton." These, however, have not survived in Barton's collection at the Academy of Natural Sciences, Philadelphia. Baldwin, always critical, was respectful of Barton but remarked on one occasion that he was not always able to "guess his motive." At another time: "Dr. B. will have an opportunity to criticize. If only the science gains, I am satisfied," and perceptively in 1813 Baldwin wrote: "Like my preceptor, Dr. B., I have too many irons in the fire."[8] Baldwin wrote from Savannah to John LeConte complaining of Elliott's "management of my new plants." He asserted that Elliott had named and described his new *Xyris* and that Elliott had concluded to recall and reprint the first number of his *Sketch*, "I will either be a *botanist* or give it up entirely, at all events, I would sooner make a *bonfire* of my herbarium than have my plants thus mangled. I do not now, however, accuse Mr. E. of any design to injure me but he was not authorized to take up my plants, name, and describe them, either correctly or

5. Wm. Darlington to Richard Harlan, January 5, 1828, Darlington Correspondence, New-York Historical Society.

6. *Memorials of John Bartram and Humphry Marshall* (1849; reprint ed., New York: Hafner, 1967), p. 24.

7. Wm. Darlington, *Reliquiae Baldwinianae* (1843; reprint ed., New York: Hafner, 1969), p. 17.

8. Ibid., pp. 82, 86, 89.

incorrectly, without my permission. . . . But let all this remain sacred between you and me. There is now a good understanding between us."[9]

On June 19, 1817, Baldwin was on the schooner *Eagle* waiting for clearance, and was threatened with return to quarantine because he had failed to follow instructions. He had on board a box of live oaks for Darlington. He wrote "*I am here* in 5 days from Savannah but a *prisoner* on board. . . . This will be a horrible bore. . . . I am in no humour for wishing to have escaped the Indians in Florida, to run foul of a silly quarantine so near home is too bad."[10]

When Asa Gray received the parcel of Baldwin's letters for which Darlington had sought advice regarding publication, Gray wrote: "I am charmed with Baldwin's letters. . . I say publish by all means. . . His letters tell the story for themselves, and enable us to understand the more, and appreciate his talents, real, and acquirements, as well as the goodness of his heart. If he had lived, he would have outstripped all his contemporaries."[11] Darlington's third son, Edward C., printed his father's memorial volume of Baldwin letters. The Record Book of the Chester County Cabinet of Natural Science for 1828 records what must surely have been Darlington's verdict on Baldwin, that "A more amiable and genuine philanthropist has seldom lived; he was as free from guile as the simple nature in which he so much delighted."[12]

Benjamin Silliman, not a botanist, but a mineralogist, chemist, geologist, and the most fundamentally religious of the five pupils, served with Eli Ives, also a pupil of Barton, at Yale. It may have been Ives who persuaded Silliman to study in Philadelphia. Together they established a medical school at Yale in 1813. Silliman made two visits to Philadelphia primarily to improve his background in chemistry and mineralogy. The first was in 1802, when he also attended Barton's lectures; the second was in the winter of 1803–04. He was annoyed when in the course of chemical lectures given by Dr. James Woodhouse, whose class of 120 pupils was one of the largest in the University, the

9. Wm. Baldwin to John Le Conte, November 16, 1816, Miscellaneous Letters (QH 26 A8), Academy of Natural Sciences, Philadelphia.

10. Wm. Baldwin to Wm. Darlington, June 19, 1817, Chester County Historical Society; the author wishes to thank Dr. Dorothy Lansing for supplying this letter.

11. Asa Gray to Wm. Darlington, April 27, 1841, Darlington Correspondence, New-York Historical Society, vol. 1, letter no. 13.

12. Record Book (1838) pp. 53–54. Examined June, 1952, at West Chester.

professor treated with levity and ridicule the idea that the scourge of yellow fever in Philadelphia might be a divine visitation for sins of the people. Woodhouse "imputed them to the material agencies and physical causes, forgetting," said Silliman, "that physical causes may be the moral agents of the Almighty."[13]

Silliman was twenty-three years old when he first lived in Philadelphia. He found vigorous exercise essential to offset incipient gout—we may wonder whether he consulted Dr. Barton for medical help—and private prayers to combat the worldly spirit of the Philadelphians. In 1805, while Silliman was in England, ostensibly to collect materials for his future classes at Yale, he visited botanical gardens. He found Liverpool's botanic garden "a place of great beauty." On January 27, 1806, while he was walking to Leith, he paused at the Royal Botanic Garden, notable he said, for the gentle slopes that best show off the plantings. We may think Barton gave some impetus to all his ogling of plants, but then, when Silliman made an excursion to Richmond, he wrote, "we arrived at the Botanic Garden [i.e., Kew], but, too late to be admitted to see it, and, indeed, I was not displeased at the disappointment, for I did not wish to turn my head to any other subject, and therefore, stepping into a coach, we returned immediately to London."[14] In 1826, after Darlington had presented him with a copy of his *Florula Cestrica*, Silliman thanked him for "a valuable contribution to our botanical knowledge."[15]

At Westminster Abbey, Silliman found the inscription for John Gay, of the *Beggar's Opera*, in the Poet's Corner. He recorded in his journal "surely a sepulchral monument is the last place on which a witticism ought to appear."[16] The witticism:

> Life is a joke, and all things show it;
> I thought so once, but now I know it.

Silliman established himself firmly in the development of American science through his teaching and his editorship of the *American Journal of Science*.

13. J. F. Fulton and E. H. Thomson, *Benjamin Silliman* (New York: Schuman, 1947), p. 29.

14. Benjamin Silliman, *Journal of Travels in . . . the Years 1805 and 1806* (New York, 1810), 2: 318 and 1: 344.

15. B. Silliman to Wm. Darlington, October 14, 1826, Darlington Papers, New-York Historical Society.

16. Silliman, *Journal of Travels*, 1: 157.

Jacob Bigelow, born 1787, son of a Congregational parson at Sudbury, Massachusetts, graduated from Harvard in 1806, then taught in Boston Latin School before he decided to attend lectures by Doctors Rush, Barton, Wistar, and Physick. On March 6, 1810 he wrote home that "the medical lectures have concluded, our professors have set their mills a-going for manufacturing doctors. Happening to pass by the University today, I got one foot entangled in the mill, and not being able to disengage myself, was drawn in and ground over for about an hour, then came out Dr. Bigelow."[17]

Bigelow told Samuel D. Gross that when he was in Philadelphia "there was constantly battling going on between the professors . . . Rush and Physick were on one side; Wistar and Barton on the other." Barton, he said, was egotistical, a bad reader and speaker, Rush was enthusiastic and eloquent, an earnest believer in medicine and drugs. "Wistar was warm-hearted; Physick was a savage, and would have no intercourse with us."[18]

Bigelow was aware of the need for instruction to farmers and the local doctors in distinguishing among the noxious weeds and drug plants in compounding remedies. He wrote that "above all the things we sorely lack in this land of Milk and molasses is good Botanical books and plates. . . . Upon the faith of a Mussulman I think a man might signalize himself without difficulty among the New Englanders who are as ignorant of botany as a nation of Jackasses."[19] And so he set about to tackle ignorance, and in 1814 published his *Florula Bostoniensis*. In the preface he confessed "I flatter myself that among its faults, the most numerous will not be its errors; and whatever may be its fate with the public, I shall retain the consciousness that it has not been the result of superficial inquiry, or negligent observation." He spiced his books with comment. For example, in discussing scientific names he says that comparative appellations are meaningful when one knows the basis of comparison. For instance, if the species compared is a European *Carex*, it is futile to name a *Carex vulpinoidea* if we do not know *Carex vulpina*. *Carex vulpinoidea* itelf is but a distant relative of a fox.[20]

17. M. L. Fernald in *Proceedings of the American Philosophical Society* 86 (1942): 67. Asa Gray mistakenly states that Bigelow took his M.D. at Harvard in *American Journal of Science*, ser. 3, 17 (1879): 263. Reprinted in *Scientific Papers of Asa Gray*, ed. C. S. Sargent (Boston, 1889) 2: 413–16.

18. S. D. Gross, *Autobiography* (Philadelphia, 1887), 2: 54.

19. J. Bigelow, Archives, Hunt Botanical Library, Pittsburgh, Pa.

20. J. E. Smith, *Introduction to Physiological and Systematical Botany* 1st Am. ed. (Boston, 1814), pp. 293–94.

A passing note on semantics of the period: you may have noticed that Bigelow in his *Florula Bostoniensis* admitted "I flatter myself." Again in his text on plant physiology we read "the editor flatters himself" that the additions he has made will be approved.[21] Barton was addicted to the phrase and I judged it a singular affectation, but I have encountered the phrase in the course of reading Jefferson and Darlington.

Asa Gray wrote "what turned [Bigelow's] attention to botany we know not," but George Ellis in his memorial on Bigelow answers the question by quoting him: "With Dr. Barton, to whom the Eastern students generally attached themselves, I became a private pupil, and got from him the rudiments of botanical taste which adhered to me for many years afterward."[22] Mr. Richard Wolfe of the Countway Library at Harvard has recently reviewed Bigelow's botanical works and concludes as I do that Barton's lectures were an important early influence, particularly in directing his interests toward materia medica and highlighting the need for an authoritative doctors' guide to medicinal plants.[23]

Oliver Wendell Holmes wrote that Bigelow's *Discourse on Self-Limited Diseases* (1835) exerted more influence on medical practice in America than any other work published in that century. It may be noticed that the germ of the *Discourse* can be traced back to Bigelow's student days in Philadelphia. There Rush with his dosing and excessive bleeding was opposed by Barton and others who took the view that a disorder takes on a kind of life history which must be recognized and that the organism may often display recuperative powers when not impeded by excessive medical treatment. Respected for his leadership in medicine, Bigelow was, in Asa Gray's words, "by far the most venerable of American botanists." When ninety years old he was visited by Holmes, who found him "one of the most serenely tranquil persons I have ever met."[24] Dr. Samuel D. Gross briefly visited Bigelow, blind and bedridden, in his ninety-second year. He was "calm and serene . . . denotive of conscious repose," reminding Dr. Gross of what he "had read of some Roman philosophers. I never looked upon a countenance in which dignity and gentleness were so beautifully blended. His mind was clear, and his memory seemingly unclouded."[25]

21. Ibid., advertisement on p. v.

22. George E. Ellis, "Memoir of Jacob Bigelow, M.D., LL.D.," *Proceedings of the Massachusetts Historical Society* 17 (1879–80): 383–467.

23. See Wm. P. C. Barton to J. Bigelow, April 10, 1817, in R. J. Wolfe, *Jacob Bigelow's American Medical Botany, 1817–1821* (North Hills, Pa.: Bird & Bull Press, 1979), p. 95.

24. John J. Morse, Jr., *Life and Letters of Oliver Wendell Holmes* (Boston, 1896), 2: 205, 241.

25. S. D. Gross, *Autobiography*, 1: 401.

A veritable jeweler of words, writing to John Torrey, Bigelow opined that "I have unwillingly and unaccountably got drawn into such a gallipot of pharmaceutics that it is with difficulty I can keep my head above the level of its adhesive contents. I never imagined that our defunct friend Lyman Spalding[26] could have intailed such a mass of drudgery on any of his unhappy survivors. But peace to his ashes! I hope he has a sprig of Scutellaria plant over his tomb to keep mad dogs and foul fiends aloof from his hybernacula."[27]

As a versifier Bigelow left us one more reason to remind us of his many talents:

TO A TADPOLE

Thou nimble, polymorphous thing,
With limbs within thee bound,
Depending on thy caudal fin
To skull thy body round!

I fain thy character would read,
From signs that thus prevail,
And swear thou hast a waggish head
On such a waggish tail.

Thou navigator of the ditch
If life in mud be sorrow,
Cheer up for he that dies today
May live to jump tomorrow.[28]

Seven years after Barton was born in Lancaster, Pennsylvania, Thomas Horsfield was born in Bethlehem.[29] Thomas was a pupil in the Moravian schools at Bethlehem and Nazareth. A scholarly influence must have been exerted on him by John Frederick Otto, M.D. from Halle. Another formative friend was the Rev. Lewis D. von Schweinitz, who was to be a pioneer in mycological studies in the Atlantic states. From 1792 until 1794 Schweinitz and Horsfield lived in apartments across the hall from each other at Nazareth. Horsfield recalled many years later in a letter to his classmate: "While a pupil at Nazareth I

26. Lyman Spalding (1775–1821), founder of *U.S. Pharmacopoeia*, printed December 15, 1820.

27. *Bulletin of the New York Public Library* 23 (Sept. 1919): 547–554.

28. Quoted by George E. Gifford, Jr., *Harvard Medical Alumni Bulletin* 39 (1965): 39.

29. Biographical notices are listed by F. A. Stafleu and R. S. Cowan, *Taxonomic Literature*, 2nd ed. (Utrecht: International Bureau of Plant Taxonomy and Nomenclature, 1979), 2: 336–37. Two useful accounts: J. B. McNair in *Torreya* 42 (1942): 1–9; M. J. van Steenis-Kruseman, *Flora Malesiana*, vol. 1, "Cyclopaedia of Collectors" (Djakarta:

acquired a taste for natural history under the tuition of Br. [Samuel] Kramsch. This has followed me through life."[30] In 1794 Horsfield became a medical apprentice at the Pennsylvania Hospital in Philadelphia. I do not know how early he enrolled in Barton's classes, but he took the M.D. degree under Barton's direction in 1798. His thesis was titled "An experimental dissertation on *Rhus vernix*, *Rhus radicans*, and *Rhus glabrum*, commonly known in Pennsylvania by the names of Poison-ash, Poison-vine, and Common Sumach." His well-planned experiments on the actions of the poisons on himself and on test animals were noteworthy for the period. He noted the different susceptibilities of different persons. Dr. Samuel Latham Mitchill of New York wrote that Horsfield's "performance would make a valuable article in an anthology of medical essays" since "the botanical and chemical knowledge displayed . . . shews the author to have been a student of no ordinary rank." Adolph Rostenberg, the dermatologist, believes that Horsfield's thesis "was the first immunological study on poison ivy dermatitis."[31]

There is no mention of Horsfield among the surviving hundreds of letters, lecture notes, and memoranda in the Barton papers. A single botanical specimen, of *Obolaria virginica* L., is in the Barton herbarium and bears a label in Horsfield's hand stating that Mr. Kramsch called the plant "Penaea squamosa." Pursh identified the collector; this annotation would date from 1805, when Barton employed Pursh to arrange his herbarium.[32] Dr. Horsfield continued at the Pennsylvania Hospital a year after obtaining the M.D. Then he took employment as ship's

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Noordhoff-Kolff, 1950), pp. 243–244, and Supplement II (1973), p. xlvi, with portrait. This provides a full account of his Java years. Mildred Archer, *Natural History Drawings in the India Office Library* (London: Her Majesty's Stationery Office, 1962), pp. 46–48, 80–82. The Horsfield collection consists of 97 drawings in watercolor, pencil, and pen-and-ink, depicting birds, mammals, and reptiles, all in the India Office Library. These drawings are important due to loss of nearly all of Horsfield's types. J. M. Chalmers-Hunt, *Natural History Auctions 1700–1972* (London: Sotheby Parke-Bernet, 1976), p. 99. The sale of Horsfield's books, insects, herbarium, and minerals, by Stevens, London auctioneers, took place in November 1859. Chalmers-Hunt gives some information on buyers.

30. T. Horsfield, London, February 17, 1823, to Rev. L. D. von Schweinitz. Schweinitz Correspondence, Academy of Natural Sciences, Philadelphia, Collection 438, no. 156.

31. S. L. Mitchill, *New York Medical Repository* 2 (1798): 195–97; A. Rostenberg, *American Medical Association Archives of Dermatology* 72 (1955): 442.

32. Introduction by J. Ewan to Cramer reprint (1979) of Pursh's *Flora* (1814), p. 41.

surgeon on the merchantman *China*, bound for Java.[33] The beauty of Java's rain forests and the drug plants he saw being used by the natives fascinated him. Determining to follow up what he had seen in Java, he returned to Philadelphia for books and instruments for field and laboratory, and in 1801 took passage for Batavia. Unfortunately we have no record that he visited Barton during his sojourn in Philadelphia, but he was of retiring habits and perhaps did not make the effort. When another of Barton's pupils, Dr. James Bartram, was about to sail as surgeon on the *George Washington* for Batavia, Madras, and Calcutta, his uncle William advised "it may be well to consult Dr. Horsefield [sic] when thee arrives at Batavia, concerning the best regimen. To whom be pleased to present my high regard and esteem."[34]

From 1802 until 1810 Horsfield was employed in Java by the Dutch. From 1811 until his departure in 1819 he worked there for the British government; part of this time he travelled with Sir Thomas Stamford Raffles. His years in Java, Sumatra, and smaller islands were exceptional for the numbers of birds, mammals, insects, and plants—more than 1000 species—which he collected and described or had drawn by native artists. Only one third of the Lepidoptera manuscripts he left were published, and he was able to complete the descriptions of only two of the five orders of birds he had catalogued while serving as Keeper of the East India Company Museum in London from 1820 until his death in 1859. Horsfield was elected to the Linnean Society in 1820, and the Royal Society in 1828—one of few Americans so honored. He was also a founding member of both the Zoological Society and the Royal Entomological Society. In 1819, after Horsfield's collecting in Java drew to a close, Joseph Dalton Hooker was approached to carry on the work so ably begun, but Hooker was advised by many friends that the duties might cost him his life and so he declined the offer.

In his letter of February 17, 1823 Horsfield wrote to Rev. von Schweinitz that he "had reason to be thankful for my present patrimony, with continued labours, cares and vicissitudes not nearly so great. I am now calmly lodged in London. The particular nature of my pursuits and the connections which they have established have occasioned a delay in my return to my native country. I sincerely regret this, but I have no alternative. Instead of collecting money I collected objects of natural

33. See "Voyage to Batavia in the year 1800," *Philadelphia Medical Museum* 1 (1805): 75–82.

34. N. B. Fagin, *William Bartram, Interpreter of the American Landscape* (Baltimore: Johns Hopkins Press, 1933), p. 203.

history, and I am obliged, be it agreeable or not to make some use of these for my maintainence." Horsfield hoped that he might establish an entomological exchange with Moravian collectors in America. He suggested that von Schweinitz carry a small phial of spirits for the minute beetles that he would find on his fungi.

And so we have noticed five Barton men: independent-minded Baldwin, light-hearted Bigelow, indefatigable Horsfield, enterprising Silliman, and fraternal Darlington. Three took ships bound for a garden on the banks of the Hoogly, and two returned with seeds for their mentor; the third returned to Java to live eighteen years seeking new life forms in the jungle. Three graced the lecture halls, laboratories, or bedsides of Boston, New Haven, and West Chester. One of them perhaps spoke for the others when in his dissertation he declared:

> The enlightened Professor of Materia Medica, in particular, has conferred obligations which it will ever be my duty and pride to acknowledge. To his polite and friendly instruction I owe that taste for the study of nature, from which I anticipate the most rational and lasting pleasures of my life. It is his happy attribute to fascinate his pupils with the sciences he so ably teaches.
>
> It is time for the haughty bigots of the Old World to acknowledge and revere the scientific talents of America. No longer can it be said, to the reproach of our country, that all her productions are of an inferior order. As she has produced a Washington, a Franklin, and a Jefferson, to wrest and preserve our rights and liberties from the grasp of transatlantic tyrants,—so has she given us a Rittenhouse, a Rush, and a Barton, to maintain our dignity and independence in the various branches of Philosophy, Medicine, and Natural History.[35]

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35. Wm. Darlington, "A Dissertation on the Mutual Influence of Habits and Disease" (Diss., University of Pennsylvania, 1804), p. 35. A copy is available in the Library of the American Philosophical Society.

Samuel George Morton's Doctoral Thesis on Bodily Pain: The Probable Source of Morton's Polygenism

FRANK SPENCER

DURING the 19th century there was much discourse on the subject of human racial differences. In pre-Darwinian America, as in Europe, the scholars who now are usually called polygenists endeavored to account for these differences by arguing for a separate (and thereby unequal) creation of human races. This argument was strongly contested by other scholars, the monogenists, who had strongly orthodox faith in scripture and traced human diversity to an original Adam and Eve. They sought scientific sanction for the alleged inferiority of non-whites by invoking the degenerative influence of the environment. Thus "scientific" opinion differed on the potential transience or innate permanence of the inferiority that was believed to exist among non-Western peoples.

Samuel George Morton (1799–1850), a prominent Philadelphia physician and anatomist, entered this debate in 1839 with the publication of a book titled *Crania Americana*. The importance of this and his subsequent work was that Morton attempted to replace speculation with hard empirical data. Using a unique and privately assembled collection of human crania which represented all known racial groups and which by mid-century had come to be known as "the American Golgotha," Morton set about the task of comparing human crania according to a dozen or more measurements. Morton was clearly influenced by the work of E. J. Doornik (1808), J. B. von Spix (1815), F. Tiedemann (1836), and other European craniologists, but in addition he was responsible for introducing several new measurements and instruments which did much to advance the incipient science of

1. Samuel G. Morton, *Crania Americana* (Philadelphia: Dobson, 1839).

2. E. J. Doornik, *Wijsgeerig—natuurkundig Onderzoek aangaande den oorspronglijken Mensch ende oorspronglijkt Stammen van deszelfs Geschlacht* (Amsterdam, 1808); J. B. von Spix, *Cephalogenesis* (Monachii: F. S. Hubschmanni, 1815); F. Tiedemann, "On the brain of the Negro, compared with that of the European and Orang-Outang," *Philosophical Transactions of the Royal Society, London* 126 (1836): 497–527.

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craniology. Indeed, his craniometric researches had a profound influence on Paul Broca and on the direction taken by French anthropology during the second half of the 19th century.[3]

On the basis of his researches for *Crania Americana* and for his *Crania Aegyptiaca*,[4] Morton is seen to reject the environmental hypothesis, which maintained that human racial difference was due merely to disparities in local experience, in favor of the notion that human racial morphology is fixed.

In view of Morton's evident preference for data, it is legitimate to ask whether his emergent polygenism was forced upon him by facts or was an *a priori* notion. The evidence is by no means decisive, but there is every indication that the second of these alternatives is the true explanation of his opinions,[5] and that in this regard Morton's anthropological perspective was influenced by an intellectual commitment to the fundamental principles of constitutional pathology which at that time were inextricably entwined not only in general medical theory but also in the new science of phrenology.

Recent histories of anthropology are confused with regard to Morton's apparent concern for phrenology. For example, in his book, *The Leopard's Spots*, William Stanton has implied that Morton simply flirted with the ideas of Franz Joseph Gall (1758–1828) without truly accepting them.[6] Evidently Stanton, like many other authors,[7] finds his association with the doctrines of Gall to be something of an embarrassment. Closer examination shows, however, that Gall's phrenological work, namely his interest in cerebral localization, was far less noxious than the claims made by later phrenologists such as George Combe (1788–1858). Indeed, the concept of localization, as adopted and advanced by Broca, made an important contribution to our understanding of human neuroanatomy.[8] Further, while undecided about Morton's reasons for

3. C. L. Brace, "The roots of the race concept in American physical anthropology," in F. Spencer, ed., *A History of American Physical Anthropology 1930–1980* (New York: Academic Press, 1982), pp. 17–20.

4. Samuel G. Morton, *Crania Aegyptiaca* (Philadelphia: Pennington, 1844).

5. S. J. Gould, *Mismeasure of Man* (New York: Norton, 1981).

6. W. Stanton, *The Leopard's Spots: Scientific Attitudes Towards Race in America, 1815–1859* (Chicago: University of Chicago Press, 1960), pp. 27–29.

7. See A. Hrdlicka, "Physical Anthropology: Its scope and aims; its history and present status in America," *American Journal of Physical Anthropology* 1 (1918): 145–47.

8. See F. Schiller, *Paul Broca: Founder of French Anthropology, Explorer of the Brain* (Berkeley: Univeristy of California Press, 1979).

collecting human crania, Stanton is convinced that Morton's collection was not formed for the purpose of phrenological study.[9] To support this view, Stanton cites Morton's article, "An Account of a Craniological Collection; With Remarks on the Classification of Some Families of the Human Race." Here Morton offered the following explanation:

> Having the occasion in the summer of 1830 to deliver an introductory lecture to a course in anatomy [at the Philadelphia Association for Medical Instruction], I chose for my subject the different forms of the skull as exhibited by the five races of men. Strange to say, I could neither buy nor borrow a cranium of each of these races. . . . Forcibly impressed with this great deficiency in a most important branch of science, I at once resolved to make a collection myself.[10]

In 1848, when Morton made this statement, phrenology was already in decline, especially in Philadelphia. This fact is clearly reflected in the gradual decrease in the number of phrenologically oriented M.D. theses produced at the University of Pennsylvania after 1840.[11] Hence Morton clearly was not inclined to draw attention to his earlier involvement in the subject.

Morton's earlier intellectual commitment to phrenological doctrine is revealed to some extent in his published works. For instance, on the first page of *Crania Americana*, Morton wrote that he and his technical assistant, John Phillips, had "long admitted the fundamental principles of Phrenology, viz: That the brain is the organ of the mind, and that its different parts performed different functions." Their commitment, however, was qualified: "but we have been slow to acknowledge the details of Cranioscopy as taught by Dr. Gall, and supported and extended by subsequent observers." But while Morton did not deduce *Crania Americana* from phrenology, he nevertheless implied that it was a test. "We have endeavored," he wrote, " to examine it [phrenology] in connection with numerous facts, which can only be fully appreciated when they come to be compared with similar measurements derived from the other races of men." And evidently he considered the

9. Stanton, *The Leopard's Spots*.

10. Samuel G. Morton, "An account of a craniological collection; with remarks on the classification of some families of the human race," *Transactions of the American Ethnological Society* 2 (1848): 215.

11. *Catalogue of the Alumni of the Medical Department of the University of Pennsylvania, 1765–1877* (Philadelphia, 1877).

phrenologic hypothesis confirmed: "I am free to acknowledge that there is a singular harmony between mental character of the [American] Indian, and his cranial developments as explained by Phrenology."[12]

Although much evidence indicates that Morton was enthusiastic about George Combe's American lecture tour in 1839,[13] until now, very little has been uncovered to suggest an earlier and long-standing intellectual commitment to phrenological principles. In this regard, it is not known to what extent Morton participated actively, if at all, in the early phrenological movement in Philadelphia. According to Erickson, while Morton was in Edinburgh, he attended meetings of the "fledging Phrenological Society," but this statement has not been substantiated fully.[14] It is not insignificant that Morton was intimately associated with a number of leading advocates of the "science" in Philadelphia. In particular there was Philip Syng Physick (1768–1837), Morton's mentor at the University of Pennsylvania and first president of the Central Phrenological Association in Philadelphia. Morton's Edinburgh thesis was dedicated to Physick. And in his own age group one can identify Richard Harlan (1796–1847), Franklin Bache (1792–1844), and George McClennan (1796–1847), all of whom were early and active supporters of phrenology.

In view of Physick's interest in phrenology and his apparent close association with Morton, these facts suggest a Philadelphian genesis for Morton's interest in phrenology; in addition there are the obvious connections between phrenology and constitutional pathology. For these reasons it was decided to look at Morton's Edinburgh doctoral thesis in the hope that it might throw light on this interesting question.

De Corporis Dolore

Although it is repeatedly stated in the literature that Morton attended the University of Edinburgh from 1820 to 1823, and graduated M.D. on August 1, 1823, with a thesis titled *De Corporis Dolore* (On Pain of the Body), it appears that for much of this time he was either incapacitated by a "liver complaint" (1820) or was traveling in Europe

12. Morton, *Crania Americana*, p. i.

13. A. Boardman, "Mr. Combe: His labors and reception in the United States," in G. Combe, *Lectures on Phrenology* (New York: Edward Kearny, 1846), pp. vii–viii; Stanton, *The Leopard's Spots*, pp. 37–38.

14. Paul A. Erickson, "Phrenology and Physical Anthropology: The George Combe Connection," unpublished manuscript, Department of Anthropology, St. Mary's University, Halifax, Nova Scotia, c. 1975.

(1821–1822). He did not in fact attend lectures or begin to work on his thesis until the autumn of 1822.[15]

As far as I have been able to ascertain, the text of the thesis (presented in Latin) has never been described or translated. Although the ideas expressed in it are by no means novel, they are of great interest. Besides presenting evidence related to the question of Morton's incipient interest in phrenology, it provides evidence of the popularity and influence of Erasmus Darwin's work in the United States at the beginning of the 19th century.

Morton's thesis is divided into three sections. The first, pages 2–11, is titled (in translation) "Nature of Pain, and about Its Causes, Its Varieties, and Its Utilities"; the second section, pages 12–27, is titled "Effects of Pain on the Body"; while the third, pages 27–37, is designated "Effects of Pain on the Mind."

Section I: De Doloris Natura

Prior to 1840, when the renowned Berlin physiologist Johannes Müller (1801–1858) presented his theory of specific energies of nerves, there was no unifying doctrine of pain to shape scientific inquiry, nor did any acceptable principle of classification exist.[16] Erasmus Darwin's (1731–1802) somewhat eclectic and patently vitalistic system of theoretical physiology and pathology had been set forth in his treatise *Zoonomia*.[17] Here Darwin proposed that pain was the effect of "sensorial motions," a proposition that opposed traditional thinking by demanding

15. See G. B. Wood, "Memoir of Samuel George Morton, *Transactions of the College of Physicians of Philadelphia* 1 (1853): 376–77.

16. Müller (1840) demonstrated that different objects produced the same effect with the same nerves, while the same objects produced very different effects with different nerves. This was a significant advance, since it had been believed previously that sensory nerves conducted to the brain the specific properties of the objects perceived. For further details on the pre-Müllerian theory of pain see J. Soury, *Le système nerveux centrale; structure et fonctions; histoire critique des théories et des doctrines* (Paris: Carré et Naud, 1899).

17. Darwin's *Zoonomia* (1794–96) represents the culmination of his inquiries into the nature of animal life. Essentially, the treatise is divided into three sections. The first is devoted to observations and speculations on a variety of phenomena related to organic life. The second is a "Catalogue of Disease," in which Darwin endeavored to classify human disease after the fashion of Linnaeus. The third is a materia medica. Indicative of the work's popularity was its prompt translation into French, German, and Spanish. Several American editions were published between 1796 and 1818.

that pain be recognized as a sensory quality rather than a phenomenon which transcended the limitations of the sensory field.

The key to Darwin's system of theoretical physiology is motion, "the spirit of animation" as he called it. This vitalistic force, he believed, was the cause of all "fibrous" (i.e. muscular) contractions in the body. He envisioned four modes through which this animating force operated: 1) irritative motions, caused by objects external to the organ affected; 2) sensitive motions, which are caused as a consequence of pleasure or pain; 3) voluntary motions, which are caused by volition; and 4) associative motions, which are caused by the association of different muscle contractions.[18] Hence, according to Darwin, pain resulted whenever sensory motions were stronger than usual. In this respect Darwin may be regarded as a forerunner of the "intensive" theory of pain, which was introduced several decades later. According to this theory pain was not a specific sensation but one of degree; every sensory stimulus, if it attained sufficient intensity, was capable of producing pain.[19] It is interesting to note that about a decade after Darwin, Charles Bell (1774–1842) of the Univeristy of Edinburgh posited a similar theory, but did not refer to Darwin.[20] For reasons not at all clear, Morton makes no mention of Bell's work.

Significantly, Morton's dissertation begins with a consideration of Darwin's theory of pain:

> According to him [Darwin], it [pain] depends upon increased or diminished activity of some part. A too strong or too weak stimulus must be taken as the remote cause. On these grounds Darwin divides pain into two classes, of which one is characterized by an excess of motion, the other by the absence of it; the former can be discerned by the heat of the painful part or the whole body, while in the latter case the heat of the affected part is not increased, and often coldness in the extremities accompany the pain, an important indication of so-called nervous pain.[21]

18. E. Darwin, *Zoonomia, Or the Laws of Organic Life* (London: J. Johnson, 1794), I, sect. 5: 32–33.

19. W. H. Erb, *Die Krankheiten der peripheren-cerebrospinalen Nerven* (Leipzig: Vogel, 1876).

20. C. Bell, *A new idea of the anatomy of the brain* (London, 1811).

21. *De Corporis Dolore*, pp. 3–4: Causam proximam doloris duplicem naturam habere existimat; pendet, secundum illum, ex actione vel aucta vel diminuta partis alicujus. Incitamentum vel nimium vel nimis parvum pro causa remota habendum est. Talibus rationibus adductus DARWIN dolorem in duas classes dividit, quorum illa motus

Morton's purpose was not to analyze the philosophical merits of Darwin's theory, which he evidently found most attractive, but rather to "expose the facts connected with it." Hence, after this cursory introduction, he diverts his attention to the "various causes inducing pain." Two main categories are recognized: 1) those caused by "external objects touching sensitive fibers," and 2) those caused by a "sickly action occurring spontaneously." The former category is subdivided into two classes: mechanical and chemical actions:

> Mechanical things induce pain through crushing, cutting, stabbing, tearing, as in the case with blows, with wounds inflicted by the sword, and with contusion. Chemical substances affect living wholes by corrosion and solution, as can easily be seen by the effects of acids, herbs, some fossil matter, and alkalis.[22]

In the latter category are placed a variety of pathological conditions such as gout and renal calculi. After a brief description of the above categories, Morton notes that pain is influenced differentially by age, sex, and the composition of the body:

> Usually sensation is sharper in children than in adults, particularly in old people, for with age the sensitiveness declines. Women feel pain more sharply than men, as do thin people more than fat people, and short ones more than tall ones.[23] Moreover, the various compositions of the body are subject to a different kind of pain, regarding its degree and nature. Many parts lack sensation as long as they are in a healthy state, but during sickness, they hurt deeply, and even the same sickness makes for a different pain according to the composition of the affected part.[24]

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excessu, et haec ejus defectu notatur; illa partis dolentis, vel totius corporis, calore discernenda est, dum in hac partis affectae calor non augetur; et saepe extremarum corporis partium frigus dolorem comitatur, indicium quidem insigne eorum dolorum qui Nervosi appellantur. For the reference to Darwin see *Zoonomia*, 1, sect. 34: 421.

22. *De Corporis Dolore*, p. 5: Res mechanicae conterendo, secando, pungendo, lacerando, dolorem inducunt, veluti in ictibus, in ensium vulneribus, et in contusionibus. Chemicae substantiae solida viva corrodendo et dissolvendo, ut in effectibus acidorum, herbarum, materiarum quarundam fossilium et alkalinorum, facile animadverti potest.

23. Here Morton cites "Portal, Anat. Med. tom. iv, p. 134." This is presumed to be Antoine Portal's "Cours d'Anatomie Médicale, ou Eléments de l'Anatomie de l'Homme, avec des remarques physiologiques et pathologiques, et les résultats de l'observation sur le siège et la nature des maladies, d'après l'ouverture des corps" (Paris: Baudoin, 1804).

24. *De Corporis Dolore*, pp. 6–7: Sensus est plerumque magis acutus in infantibus quam in adultis, et in his postremis quam in senibus, nam sensus cum aetate deficit. Mulieres acrius quam homines, macri plus quam obesi, qui parva magis quam qui procera sunt

Another factor considered to influence the manifestation of pain is the external environment:

> Pains vary with the weather; so rheumatism is more acute in cold, humid and changing weather, while the pains of a person suffering from syphilis of the bone always increase in the warmth of his bed. Moreover, "almost all pains," says WINTRINGHAM,[25] "the lasting ones, as well as the sharp ones, get worse because of sudden changes in weather conditions, especially at the concurrence of the sun and moon, and nearly always during the night.[26]

At this juncture Morton reviews a number of miscellaneous phenomena, such as that of referred pain. He notes the conditions and signs of pain:

> It happens not infrequently that the aching of a disease is felt first in a part far removed from the unhealthy seat of action. These pains are usually called sympathetic and are attributed to what is rightly called the nervous consensus; however, although the fact itself is very well documented, little is definitely established about the laws governing the remarkable phenomenon.[27]

In concluding the first section of his dissertation, Morton wrote as follows:

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statura, sentiunt. Praeterea varii corporis contextus dolori obnoxii sunt diverso, et quod ad gradum et ad naturam attinet. Nonnullae partes sano statu, sensu carent, sed in morbo aciter dolent; et etiam idem morbus efficit, ut dolor diversus sit, secundum partis affectae contextum.

25. Reference to the English physician Sir Clifton Wintringham (1710–1794), who published *De Morbis quibusdam Commentarii* (London: T. Cadell, 1782–91), 2 volumes. See vol. 1, observation 201.

26. *De Corporis Dolore*, p. 7: Coelo quoque dolores subinde variantur; sic rheumatici sunt acerrimi dum tempestas sit frigida, humida et mutabilis; contra, dolores syphilitici ossium, semper gravescunt cum aeger in lecto calet. Praeterea, "dolores fere omnes," dicit WINTRINGHAM, "tam diuturni quam acuti, a subitis tempestatum mutationibus, praesertium ad solis et lunae concursus, et fere semper sub noctem, exacerbantur."

27. *De Corporis Dolore*, pp. 7–8: Alia res et profecto insignis de dolore notanda est: haud raro accidit, ut dolor morbi, in parte procul ab actionis morbosa sede, primum sentiatur: hujusmodi dolores sympathetici plerumque vocantur, et consensui nervoso, ut appellantur, recte attribuuntur: quamvis autem factem ipsum valde notum sit, nihilominus de legibus quibus hoc notabile phaenomenon gubernatur, parum constat.

> As far as the physical nature of man is concerned, what has been said so far refers especially to the use of pain; in addition much can be said about pain as related to behavior. I do not intend to embark upon a metaphysical discourse, though it may be permitted to make a few observations. The wise Maker of things, giving us command over the various parts of our bodies, so that we may move them and keep them in line with our decisions, and because, at the same time, He provided us with the voluntary dominion over cogitations of our mind, it is necessary that there be attractions which incite these forces to action and which help us discern external objects rightly. Two principal stimuli by which, at any time, we are forced to use these faculties, are pain and pleasure. Unless these stimuli act, as the celebrated Locke rightly remarked . . . we would have no reason why we should prefer one thought or act over another, or the mind's attention over inadvertence, or movement over rest; therefore in that case we would let our thoughts wander independently of advice and command. . . . Thus Nature appointed monitors to direct man and keep him in the right path of life; and in this office pains function at the full; by preserving their instructions we escape many vexations of life; disregarding them, however, we often suffer the severest torments.[28]

Here Morton cites 1) James Gregory's "Conspectus medicinae theoreticae ad usum academicum" (Edinburgh: Creech, 1813), section 340, and 2) the 1767 edition of Giovanni Battista Morgagni's "De sedibus et causis morborum per anatomen indagatis libri quinque dissectiones, et animadversiones, nunc primum editas complectuntur propemodum innumeras, medicis, chirurgis, anatomicis profuturas" (Batavorum: Haak, 1767), letter 53.

28. *De Corporis Dolore*, pp. 10–11: Quod ad physicam hominis naturam spectat, haec jam dicta magis praesertim ad doloris usus referantur; praeterea, de dolore quod ad mores attinet, multa dici possunt. Non disquisitionem metaphysicam ingredior, unam tamen vel alteram rem notare licebit. Sapiens rerum Opifex, quippe quia nobis, in singulas corporum nostrorum partes, imperium dederit, ut eas moveamus, et ad arbitrium compescamus, et quod etiam simul voluntariam dominationem in animorum nostrorum cogitationes, nobis suppeditaverit, necesse est, ut blanditiae sint, quae has vires in actionem excitent, et quae sint nobis auxilio ad recte res externas discernedas. Duo stimuli praecipui, quibus, omnibus temporibus, cogimur his facultatibus uti, sunt Dolor atque Voluptas et forsitan uterque aeque prodest. Nisi hi stimuli agerent, ut celeberrimus LOCKE rite observavit: . . . nullam quidem causam haberemus, quare alteram alteri cogitationem actionemve, aut animi attentionem negligentiae, aut motum quieti, anteponeremus; itaque, neque corpora nostra, neque mentes nostras, exerceremus, sed cogitationes vagari, consilio et imperio immunes, permitteremus. . . . Itaque ad hominem dirigendum et conservandum in recta vitae via, monitores Natura collocavit; et hoc officio dolores maxime funguntur; quorum consiliis obtemperando, complures vitae molestias effugimus; comtemptis autem eisdem, saepe supplicia gravissima subimus.

For Morton's reference to Locke, see *An Essay Concerning Human Understanding* (London: T. Bassett, 1689), vol 1, chapter 7, paragraph 3.

Section II: De Doloris in Corpore Effectibus

The second section begins with a description of an experiment on live muscle:

> [W]hen living animal muscle is bared and an irritating object is brought into contact with it, an involuntary contraction of the fibers of that part follows. If this stimulus is intensified and the stimulation continued, the contractions of the muscle becomes more general: trembling, gnashing of the teeth, and other attending phenomena of sharp pain, constant contortions of the body, as they are called, appear. Furthermore, when the pain becomes still more acute, it ends in convulsions: alternating contraction and relaxation of the muscles. Finally, if it lasts a long time, and, indeed, in some cases if it stays only a short time, it induces a spasm; this spastic rigidity of the muscle differs from convulsions because it does not allow any alternating relaxation. However, it is clear that these are only varieties of the same effect, determined merely by the intensity of the stimulus.[29]

To what extent Morton utilized his own observations in the foregoing description is not revealed. Although no such description appears in Darwin's *Zoonomia*, accounts of similar experiments can be found in the work of Hermann Boerhaave (1668–1738) and his student Albrecht von Haller (1708–1777).[30] Continuing along this theme, Morton noted that there were instances

> where the irritation seems inadequate to explain the amplitude of the events: thus we hear of women having fallen in convulsions, merely because of the offensive smell of some flower or drug. These adverse effects can only be explained by what they call "Idiosyncracies," and

29. *De Corporis Dolore*,pp. 12–13: Sic si musculus in animali viventi nudetur, et illa res irritans ei admoveatur, invita fibrarum partis contractio sequitur. Sic hic stimulus ampliatur, incitatio quoque augetur, et contractiones musculorum magis generales fiunt; tremores, dentium frendor, et alia doloris acuti comitantia, corporis contortiones, sicuti nominantur, constantes sese exhibent. Porro, si dolor adhuc amplius gravescit, in convulsionibus, in musculorum alternantibus contractionibus, nec non relaxationibus, finitur. Denique, diu moratus, et revera, in quibusdam casibus, etiamsi brevi tempore maneat, spasmum inducit; eam scilicet musculorum rigiditatem spasticam, quae ab convulsionibus, nullam relaxationem alternam habendo, differt. Manifestum est tamen, has esse solummodo ejusdem effectus varietates per intensionem suam tantum discretas.

30. H. Boerhaave, *Academical Lectures on the Theory of Physic* (London: W. Innys, 1743); A. von Haller, *Dissertation sur les parties irritables et sensibles des animaux*, trans. from Latin by M. Tissot (Lausanne: Marc-Michel Bousquet, 1755).

> persons not equipped with the same idiosyncracies are unable to judge these effects which, for them, seem to result from the slightest cause. This has to be referred to the weakening action caused by a pain which the famous Darwin attributed to a deficient stimulus.[31]

These interesting and puzzling phenomena Morton explained in the following manner:

> [T]he whole body, or only part of it, can drop so far below the usual degree of natural activity, that the pain of debility becomes indirectly an incentive resistance which shows itself in a more or less serious convulsion.[32] This convulsion, accompanying a deficient action, constitutes a mode of curing, whereby Nature restores the [vital] force of the debilitated part, and removes the pain which this debility had created. For, in these cases, the pain must not be considered as resulting from the spasm as stated by some authorities, but rather as the product of the former.[33]

From this, Morton maintained that pain evidently served an important remedial function by promoting vigorous muscular action, which endeavored to free the body of the "special condition" that had caused the pain.

31. *De Corporis Dolore*, pp. 13–14: [Aliquando tamen, convellentes motus fieri cernimus,] ubi irritatio, ad magnitudinem eventuum explicandum, impar videtur: ita accipimus mulieres, in convulsionibus decidisse, solummodo ab cujusdam floris, vel medicamenti ingrato odore percepto. Hi effectus quantumvis inter se adversantes, non explicandi sunt, nisi eo quod *Idiosyncrasia* appellatur, et homines non simili idiosyncrasia praediti, judices inepti sunt, effectuum quae iis a causa levissima pendere videntur. Haec referenda sunt actioni convellenti, eo dolore excitatae, quem cl. DARWIN deficienti stimulo attribuit.

See Darwin's *Zoonomia*, vol. 1, sect. 12 and 34.

32. Here Morton cites William Cullen's "First Lines of the Practice of Physic for Use of Students in the University of Edinburgh" (Edinburgh, 1778–1784), 4 volumes. See vol. 1, sect. 59; this work should not be confused with the English translation of von Haller's "Primae Linea Physiologiae," which was printed under the inspection of Cullen in Edinburgh, 1786.

33. *De Corporis Dolore*, p. 14: Sic totum corpus, vel pars tantum, adeo infra gradum solitum actionis naturalis incidere potest, ut dolor debilitatis, renixus incitamentum indirecte fiat, quod in convulsionibus, plus minusve gravibus, seipsum ostendit. Haec convulsio, actioni deficienti superveniens, curationis modum constituit, quo natura vim partis debilitate reficit, et summovet dolorem, quem ista debilitas creavit. Nam dolorem in his casibus, ut quibusdam auctoribus persuasum est, non considerandum est a spasmo oriri, sed potius hunc illius exitum esse.

Similarly, Morton believed that evoked vocalizations, such as crying and screaming during a painful episode, had palliative effects. As to the manner in which these vocalizations eased pain, he wrote:

> Because it holds for this same sensation, it is clear that the necessary effect of the respiratory organs is a strong contraction of all the muscles serving this function, and by this the faculty of resistance is amplified. But although there is no doubt that Nature instituted this use of respiratory muscles as a support in pain, it helps equally to diminish the inclination toward increased activity when a more severe paroxysm fails to come; for, although a general stimlation at first follows this effort, it usually happens that the next effect is a general deficiency of strength. This, in a way, responds to uses of a direct depletion and diminishes the disposition towards inflammation, especially after surgery. Indeed, time and again, it has struck me, that, when resisted this natural support, with the greatest fortitude, the subsequent signs of inflammation were serious, and *vice versa*.[34]

In presenting his description of the physiological effects of pain, Morton stated:

> During the paroxysm of a sharp pain, the pulse usually becomes faster and stronger.[35] . . . Various secretions increase a little in quantity. . . . [However] . . . we can trust these observations only at the beginning. Indeed, when it lasts long enough, the quality of secretions and excretions is reversed to the opposite state.[36]

34. *De Corporis Dolore*, pp. 20–21: Quod ad hanc sensuum aequationem pertinet, liquet effectum necessarium talis usus respirandi organorum, validam esse omnium musculorum huic functioni inservientium contractionem, qua renitendi facultas ampliatur. Sed quamvis haud dubitandum sit, quin Natura hunc musculorum respirandi usum instituerit, subsidio dolori urgenti; ad minuendam proclivitatem ad auctam actionem, quandocunque gravior paroxysmus desistit, non minus confert; nam quanquam generalis incitatio hujusmodi nisum primum sequitur, plerumque accidit, ut proximum effectum sit generalis virium defectio. Hoc quodammodo usibus depletionis directae respondet, et miniut proclivitatem ad inflammationem, praesertim post operationes chirurgicas. Nam mihi iterm iterumque exploratum est, cum in talibus exemplis homines summa fortitudine huic nisui naturali repugnaverint, indicia inflammatoria subsequentia, fuisse gravia; et vice versa.

35. Based on observations made by William Heberden (1710–1801). See "Of the Hectic Fever, Remarks on the Pulse," in *Medical Transactions of the College of Physicians* 2 (1772): 134; see also Heberden's *Commentarii de morborum historia* (London: T. Payne, 1802).

36. *De Corporis Dolore*, pp. 21–22: Durante doloris acuti paroxysmo, pulsus in vi et frequentia fere crescit. . . . Secretiones variae in quantitate paulo augentur. . . . Sed quod ad dolorem acutum spectat, his observationibus initio tantum confidere possumus. Quando enim hic satis diu manserit, quantitas secretionis et excretionis in statum contrarium revertitur.

The reasons for this Morton explained as follows:

> [A]t the beginning of pain, the contraction [of the muscles] forces the vessels in the extremities to empty, afterwards, however, the same cause induces a different effect within.[37]

This middle section of Morton's thesis is concluded with a four-page section designated "Physiognomy of Pain." Under this heading he describes the differential effect of acute and chronic pain upon the face. Regarding face during acute pain, Morton wrote:

> The corners of the mouth are drawn back, the nose becomes sharper, the eyebrows contract, the eyes are suffused with red, roll frequently, and are thrown wildly and horribly upon surrounding objects—the teeth are gnashed, and the whole face expresses better than any speech, the distress of the body.[38]

Developing this theme, Morton describes the famous statue of Laocoön and his sons struggling with the serpents. This statue—attributed by Pliny the Elder to Agesander, Athenodorus, and Polydorus of Rhodes, late 2nd century B.C.—is in the Vatican Museum. It appears that Morton examined the statue while touring Italy in the summer of 1822.[39] "What, indeed, can outline the anguish of the body and mind better than the father's face?" Morton writes:

37. *De Corporis Dolore*, pp. 22–23: Harum mutatiuonum ratio facile redditur; dolore ineunte fibrarum contractio ad vasa extrema deplenda conducit; postea vero, causa eadem effectum penitus diversum inducit.

38. *De Corporis Dolore*, p. 24: Oris anguli deorsum raptantur, nasus acuitur, supercilia sese contrahunt, oculi rubore suffunduntur, crebro volvuntur, et truces et horrendi in res circumjacentes conjiciuntur,—dentes frendent, et totus vultus, melius quam sermo ulla, corporis angorem exprimit.

39. See Wood, "Memoir of Samuel George Morton"; Samuel G. Morton, "Brief remarks on the diversities of the human species, and some kindred subjects" (Philadelphia, 1842), p. 14.

> Caught in the coils of the snakes, he sees his innocent children share his fate and die in the same torments, removed from any hope of salvation and help. The horrors and many distresses are not only deeply impressed in his face, but the whole attitude of the body, while, with supreme although vain effort, he tries to escape the revenge of the wrathful gods![40]

By contrast, the face of a person in chronic pain is described as follows:

> [T]he eyes, turned downward and glazed, do not express any emotion of the soul,—the nose is sharp,—the brow is furrowed,—the lips without color; and the skin, contracted over the underlying parts, is tightly stretched and shows a more than usually shining aspect. The head sinks to one side, or leans forward: all these traits combine to produce the kind of physiognomy called the Hippocratic face. All this must be noted about the face, which alone indicates the internal feelings hidden from our senses.[41]

Section III: De Doloris in Mente Effectibus

The final section of Morton's thesis is devoted to the "Effects of Pain on the Mind." Confronted with painful sensations, Morton says:

> the mind immediately takes one of two very opposite conditions, namely: Strength or Fear; in the former case the strength of the spirit surpasses the weakness of Nature, while in the latter the spirit falters.[42]

40. *De Corporis Dolore*, p. 24: Quid enim potest magis cum animi tum corporis angorem delineare, quam vultus patris? Impeditus in anguium spiris, innoxios liberos sortis sui participes, et iisdem tormentis animam efflantes, omni spe salutis et auxilii remota conspicit. Horrores miseriaeque multiplices, non modo in ejus vultu alte imprimuntur, sed quoque in tota ejus corporis compagine, dum supremo nisu, quantumvis inani, deorum iratorum vindictam effugere conatur!

To heighten the drama of this passage, Morton quotes *The Aeneid*, book 2, lines 280–95.

41. *De Corporis Dolore*, p. 26: [Facies pallida est,]—oculi demissi et vitrei, nullum animi affectum exprimunt, —nasus acutus, —frons rugosa, —labia absque colore: et cutis contracta super partes subjacentes arcte extenditur, et speciem plus aequo nitidam ostendit. Caput ad latus declinat, vel antrorsum procumbit: haec omnia conjuncta, eam effingunt physiognomiae speciem, quae *vultus Hippocraticus* cognominatur. Haec de vultu notanda sunt, qui solus internos affectus, nostris sensibus latentes, indicat.

42. *De Corporis Dolore*, p. 27: [M]ens statim unam ex duabus maxime contrariis conditionibus, assumit, nempe, Fortitudinem vel Formidinem, in illa vis animi naturae imbecillitatem superat, in hac animus cedit.

This difference, Morton believed, was influenced to some extent by the body's constitution, as well as by age and sex:

> It must be observed that women, although they feel by nature more keenly, sustain pain with greater fortitude than men. Infants almost devoid of reason, undergo pain with the utmost impatience; and when finally, the years going on, the mental faculties decline, we see man again succumb to infantile weakness in adversity.[43]

He also considered it important not to ignore the circumstances in which the "affection" was felt:

> The pursuit of fame, and the desire for immortality have often sustained the spirit marvellously during the sharpest pains. All over the world examples have been found of people suffering until death the tortures of the rack and cord, and all other kinds of torture, without uttering the slightest moan. . . . [For example,] among the aborigines of America, a prisoner, condemned by the enemy to torture and slow death, sings his funeral song unmoved; and with his last breath reproaches his executioners for their inexperience in torturing.[44]

As for the romantic notion that a creative mind was necessarily connected with an irritable body, Morton had his doubts. There was, however, he conjectured, some evidence demonstrating that pain could serve to "sharpen" the "genius." In such cases, he felt, pain was not the "principle of Mind," but rather the "stimulus." Be this as it may, of overriding importance was the individual's "spirit" or "character," the essence of which, Morton believed, was situated in the human mind:

43. *De Corporis Dolore*, pp. 29–30: Observandum est, foeminas quanquam natura acutius sentiant, majori tamen fortitudine quam viros dolorem pati. Infantes ratione fere expertes maxima impatientia dolorem subeunt; et cum tandem, volventibus annis, mentis facultates dilabuntur, virum iterum videmus, rebus adversis, infantili imbecillitate, succumbere.

44. *De Corporis Dolore*, pp. 28–29: Famae studium, et immortalitatis desiderium, saepe animum inter acerbissimos dolores mirifice sustinuerunt. Ubique gentium exempla reperta sunt, in quibus homines equulei, fidicularum, et omnigeni tormenti cruciatus, ad mortem usque passi sunt, et ne minimam quidem querelam protulerunt. Inter Americae aborigines, captivus cruciatibus et lenta morte ab hostibus damnatus, neniam cantat immotus, et supremo spiritu carnificibus torquendi imperitiam objicit.

> There is no doubt that the origin of all the varieties of character are congenital, and those differences for a greater part must be ascribed to the structure of the brain. When a child reaches puberty his faculties become brighter—age reveals the dispositions which were still hidden in childhood; however, much depends upon external causes which call them into action. Among other modes by which Nature promotes the intelligence: it sometimes sharpens the senses of the body, and thus makes the mind more inclined to receive impressions. In those equipped with a mediocre intelligence, such excitability of the senses has no effect, except that anger, love and such emotions acquire increased force; on the other hand, where the elements of a bright intelligence are given by Nature, and have showed themselves already, more or less, they become very clear for the above reasons.[45]

From this passage it is clear that Morton would have had no difficulty whatever in accepting the phrenological point of view, which, in addition to stressing the innateness of dispositions, contended that these inborn differences could be regulated, though not overcome.[46]

In bringing his dissertation to a close, Morton wrote:

45. *De Corporis Dolore*, pp. 31–32: Non dubitandum est quin primordia omnium ingenii varietatum congenita sint, quorum discrimina magna ex parte ipsius structurae cerebri tribuenda sunt: dum puer pubescit, facultates clarescunt, —ingenium quod in infante latebat aetas patefacit, sed multum tamen pendet ex causis externis, quae illud in actionem vocant. Inter alios modos quibus natura ingenium promovit, corporis sensus interdum acuit, et ita animum ad impressiones accepiendas procliviorem reddit. In iis mediocri ingenio praeditis, talis sensuum irritabilitas nil effecit, nisi ut ira, amor, et istiusmodi affectiones auctam vim acquirant; at contra ubi praeclari ingenii promordia a natura donata sunt, et jamjam sese plus minusve ostenderint, ob supra dictam causam magnopere inclarescunt.

46. J. D. Davies, *Phrenology, Fad and Science: A 19th Century Crusade* (New Haven: Yale University Press, 1955).

> Nature put a strong aversion to pain in all animals; this is especially conspicuous in humans; indeed, those endowed with reason, see farther ahead and thus are never completely without cause for fear; and it happens not infrequently that the anticipation of a remote pain is worse than the actual experience of it. Besides, humans do not only suffer because of the expectation of the pains which attend life, but the horrors which a mind conscious of evil imagines press much more while contemplating, day after day more desperate, the eternal pains and the never ending torments. Pain . . . attacks us at birth, accompanies us insidiously through life, as if insatiable; it even attends the dying and infests the last hours with anxieties. Although pain is hated and to be kept away from as far as possible, I, however, picture it as not altogether useless, but rather as a necessity to safeguard life, as constituted by the Good and Most High God.[47]

Concluding Remarks

From all indications Morton was far more serious about phrenology than recent historians have led us to believe. The recognition of this fact is important because it provides, so it is believed, a small clue, a reference point, from which to come to grips with the fundamental nature of Morton's anthropological world view.

It is evident that Morton is an essentialist in the Platonic tradition, a fact clearly demonstrable from his later pronouncements on the question of species, and in this respect I think his Edinburgh thesis does offer a clue to the possible source of his philosophical posture. His thesis, *De Corporis Dolore*, suggests that he had a substantial grounding in the classics, and it is possible that future research in this area could uncover the foundations upon which Morton's subsequent world view was built.

47. *De Corporis Dolore*, pp. 36–37: Natura omnibus animalibus advenientis doloris, odium forte inseruit: haec autem in hominibus prae aliis conspicua; illi enim utpote ratione praediti, futura remotius prospiciunt, itaque verendi causis nunquam omnino carent; nec raro evenit, ut remoti doloris anticipatio, quam praesentis experientia gravior sit. Praeterea homines non modo dolorum, praesentis vitae comitantium, expectatione cruciantur, at multo gravius urgent, horrores, quos mens sibi conscia male, fingit, dum poenas sempiternas, et tormenta nunquam levanda, indies desperatior, contemplatur. . . . Dolor enim, nos nascentes aggreditur, per totam vitam insitiosus comitatur, et quasi nunquam satiandus: adest etiam morientibus, horamque supremam angoribus infestat. At ego tamen Dolorem, quanquam invisum, et ab omnibus, quantum fieri potest, ab ipsis semotum, non omnino inutilem depinxi, sed potius eum protuli, ad vitam conservandam necessarium, a Deo Optimo Maximo constitutum.

However, it is possible at this juncture, from the evidence afforded by the Edinburgh thesis, to suggest that Morton's anthropology was, to a large extent, an extension of the doctrine of physiological vitalism that formed an intrinsic component of medical theory at the beginning of the 19th century, and that his acceptance of these views was probably determined by his earlier education (the exact nature of which has yet to be determined).

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The Scientific and Medical Genealogy of Locke's "Historical, Plain Method"*

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DURING the last three decades it has become evident that the relatively unfamiliar medical thought of John Locke (1632–1704) facilitates comprehension of the theory of knowledge which is set forth in his difficult masterpiece *An Essay Concerning Human Understanding* (1690).[1] The present article is intended to demonstrate that the "historical, plain method" presented by Locke in his *Essay*[2] was his enlarged image of the empirical science and empirical medicine that existed down to the end of the seventeenth century.

Any field of knowledge or inquiry presupposes not only a knower (the *who*) and a subject matter to be known (the *what*) but also an appropriate method of knowing (the *how*). If this applies to studies in biology or medicine, it applies also to Locke's *Essay*, whose field of inquiry comprises the whole realm of knowledge. This explains the great importance that the celebrated author of the *Essay* attaches to his "historical, plain method," which is submitted as the only *factual* way to inquire into human knowledge and its basic problems, including its definition, origins, improvement, extent, limits, reality, objectivity,

1. Patrick Romanell, "Locke and Sydenham: A Fragment on Smallpox (1670)," *Bulletin of the History of Medicine* 32 (1958): 293–321; idem, "Locke's Aphorisms on Education and Health," *Journal of the History of Ideas* 22 (1961): 549–54; idem, "John Locke's Thoughts Concerning Medical Education," in *Proceedings of the XXIII International Congress of the History of Medicine*, 2 vols. (London: Wellcome Institute of the History of Medicine, 1974), I: 371–76; idem, "Medicine as a New Key to Locke," *Texas Reports on Biology and Medicine* 32 (1974): 275–85. Biographical details on Locke the physician together with the copious medical notes from his own journals (1675–98) are available in Kenneth Dewhurst's *John Locke: A Medical Biography* (London: Wellcome Historical Medical Library, 1963).

2. John Locke, *An Essay Concerning Human Understanding* ed., A. C. Fraser, 2 vols. (1894; reprint ed., New York: Dover, 1959), I: 27; all volume and page numbers of Locke's *Essay* noted in the body of this article are those from the modernized text edited by Fraser and published in two volumes.

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sources, methods, grounds and degrees of validity (*Essay*, I: 26–27, 211–12). The paucity of scholarly materials on the subject suggests that the Lockean method has had inadequate analysis in the past. This is regrettable because the method functions as the pivot of the entire *Essay*.

Conflicting interpretations have been given by contemporary scholars. One affirms that the Lockean method is the introspective method,[3] but another denies this and contends that it is far from being that of introspection.[4] While some see the Lockean method in its own terms, that is, as historical,[5] some look at the *Essay* itself as an application of the Newtonian geometrical or analytical method to human nature.[6] Apart from the problem posed by such disagreement among authorities on the nature of the Lockean method, there is an element of linguistic irony even in their general agreement to call it the empirical method. Locke himself did not in fact and could never in principle call his method empirical, simply because in his day *empiric* was a derogatory medical term and meant a quack![7]

It behooves us to inquire why he described his method not only as historical but also as plain, and to determine why his description of it has a hitherto untraced relation, ironically enough, with the empirical medicine of antiquity. There are at least three additional reasons why the Lockean method itself deserved further attention and analysis.

3. Thomas Fowler, *Locke* (London: Macmillan, 1906), p. 149.

4. James Gibson, *Locke's Theory of Knowledge and its Historical Relations* (Cambridge: Cambridge University Press, 1960), p. 22.

5. Gunnar Aspelin, "Locke and Sydenham," *Theoria* 15 (1949): 31.

6. John Herman Randall, Jr., *The Career of Philosophy: From the Middle Ages to the Enlightenment* (New York: Columbia University Press, 1962), p. 595.

7. Locke, *Essay*, II: 445, pokes fun at those who "swallow down opinions, as silly people do empiric's pills, without knowing what they are made of, or how they will work." Such recurring ridicule of quackery and its victims serves as a timely reminder that the fluctuating variations on the term *empirical* and its cognates would make an embarrassing yet instructive episode in the history of language. Long before the word itself acquired its current aura of respectability in scientific and philosophical circles, it had been used for centuries exclusively as a medical term in two opposite senses, depending on the attendant circumstances. In the good sense, an *empiric* (Gr., *empeirikos*) was a physician relying heavily on practical as opposed to purely speculative or theoretical knowledge; in the bad sense, he was an outright quack preying slyly on the gullible. Although the current honorific term *empiricist* has lost its original *medical* connotations, those very connotations are still pertinent to John Locke as the universally acknowledged founder of British Empiricism. For Locke the *physician*-philosopher is actually an *empiric* in the originally restricted but good medical sense as well as an *empiricist* in the currently more general scientific and philosophical sense.

1. The first is that in the course of the *Essay* Locke's proposed concept of philosophical method turns out to be implicitly identical with his very concept of scientific method.[8] Such identity is concrete proof that modern philosophy cannot be isolated from modern science, especially in view of the fact that our customary contemporary distinction between philosophy and science did not hold in his times. Whether fully intended in the *Essay*—I for one doubt it—the implied identity of Locke's historical, plain method of studying human knowledge in general with his advocated method of studying nature in particular is of momentous significance for epistemology.

It signifies that epistemology can no longer be regarded as an independent and autonomous discipline but must be treated as simply a descriptive science of human knowledge, itself dependent, like every other science of its kind, upon experience and observation for both the acquisition and the validation of its sources of cognitive material. This is why, for one thing, Locke's epistemology turns out, on further analysis, to be largely a theory of knowledge whose strict guiding method is so conceived as to be applicable only to the vast domain of *scientific* knowledge, that is to say, to all questions of fact, especially those belonging to the knowledge of nature now popularly and loosely called science, the quintessence of which lies in its distinctive method or logic. It also explains why Locke himself needs a comparative logic to account adequately for mathematical and moral knowledge as distinct from scientific knowledge, since he believed that the former two cognitive types are not concerned with matters of fact.

2. A second reason is that the traditional habit of calling Locke an empiricist fails to convey all the nuances of his rich and complex triple-aspect (empirical, pragmatic, agnostic) method of inquiry.[9] Although it is true that only two (the positive two) of its three aspects are explicit in his historical, plain method, we shall see that the third or negative aspect (the sceptical or agnostic) is definitely implicit.

3. The third reason is to attempt resolution of the long-standing and conflicting interpretations of the Lockean method. The author of the *Essay* nowhere spelled out exactly what he meant by the historical, plain method, to which he was committed from the start of his inquiry into the cognitive possibilities and limitations of man as knower.

8. Compare *Essay* 1: 26–27, 210–12 with 2: 161–64, 216–18, 222–23, 346–54, for the methodological identity in question.

9. Romanell, "Medicine as a New Key to Locke," p. 278.

Despite his unfortunate neglect, it is possible to figure out the meaning of his avowed method from the context of the *Essay* and from other sources which I shall mention. It is strange that Locke scholars, who disagree as to the nature of his dominant method, have usually neglected in their turn to examine what would have helped to settle the problem, i.e. the context and genealogy of the Lockean method itself. Let us now ask what its two explicit positive aspects—historical and plain—denote and signify in the *Essay*.

From the Introduction to the *Essay* (I: 26–27) one may gather that Locke's proposed method of inquiry was intended as a critical alternative to the then-fashionable procedure of indulging in physical and metaphysical speculations on knowledge and the mind which, "however curious and entertaining," were matters that he declined expressly to "meddle with," on the alleged ground of their irrelevance to his purpose. Such deliberate refusal on his part was no more than a clever device to dismiss politely the well-known speculations of Hobbes and Descartes in particular, whose implied views on the subject in question would be judged by Locke the philosopher as fanciful instances of the "romance way" of thinking, to use the caustic but felicitous phrase of Locke the physician.

Indirect yet crucial evidence that Locke was actually proposing the historical, plain method as a needed corrective of the speculative ways of thinking comes from his significant medical correspondence with the Molyneux brothers of Dublin—Thomas the physician and William the lawyer. In his private correspondence with them (1692–97) Locke explicitly pits the sensible way of observation against the romance way of speculation in medical theory.[10] As a result, Locke the anti-quixotic physician sounds less diplomatic than Locke the anti-speculative philosopher, in that all speculative hypotheses in medicine are caricatured as "useless, tho' pleasing visions," "waking dreams," "phantasies," "and castles in the air." As in medicine, so elsewhere: he favored expelling all worthless speculative "rubbish" (*Essay*, I: 14) from the sciences!

In virtue of the whole anti-speculative and pro-realistic motivation and tone of Locke's historical, plain method, we may conclude that the "historical" element denotes the observational, descriptive, and hence empirical component. The "plain" element denotes the opposite of

10. Locke to Dr. Thomas Molyneux (Jan. 20, 1692/3), in John Locke, *Some Familiar Letters between Mr. Locke and Several of his Friends* (London: A. and J. Churchill, 1708), p. 284.

speculative, viz. the practical or useful component. Hence the complete Lockean method defended in the *Essay* signifies the method of practical observation or practical experience—in a word, the *pragmatic* method. What is the additional documentary evidence that Locke's method of inquiry is an early modern British expression of the pragmatic method?

Turning to its first or historical component, so far as I am aware, the only scholar who is specific and helpful about its antecedents is Nicola Abbagnano, who says parenthetically that Locke's method is the one "Gassendi had recommended for science as a whole."[11] Yet, how can it be established conclusively that Pierre Gassendi (1592–1655), the early 17th century French atomist and empirical critic of Cartesian rationalism, anticipates Locke's historical method not only in principle but even in name, and in so doing fills a great gap in the unfinished story of the Lockean method?

Gassendi's numerous writings include a key passage on species of knowledge which furnishes concisely the exact context of Locke's historical method and thereby throws light on its precise positive meaning and on its negative or sceptical significance. The passage comes from a Paris letter dated April 1641 (Julian calendar) and addressed to Ludovicus Valesius.

In this all-important letter Gassendi distinguishes two types of knowledge. One is attributed to God alone, namely, knowledge of the innermost natures or properties of things: knowledge of reality itself, that is, metaphysical knowledge. The other type is called, most pertinently, phenomenal or historical knowledge, that is, knowledge of the phenomena or events of nature: in other words, natural history.[12]

The fact that Gassendi not only used the cognitive term *historical* (Gassendi's L. *Historicam*, fr. Gr., *historia*: history, information) in the natural-history sense of descriptive knowledge derived ultimately from the observation of the senses, but made it synonymous with phenomenal (scientific) as opposed to innermost (metaphysical) knowledge, immediately clarifies Locke's purposes and the application and limits of the Lockean method.

11. Nicola Abbagnano, *Storia della filosofia*, 2nd ed., 3 vols. (Turin: UTET, 1963), II: 330.

12. Pierre Gassendi, *Opera omnia*, ed. H. L. Habert de Montmor, 6 vols. (Lyons: Anisson & Devenet, 1658), VI: 110.

Just as Gassendi's historical knowledge, the immediate objects of which refer solely to the actual phenomena or appearances of things, yields no knowledge of reality as such, for the same reason Locke's historical method, conceived as inapplicable to the intrinsic knowledge of the qualities that are really in things themselves, is powerless to attain any metaphysical truth (*Essay*, I: 498; II: 222). According to Gassendi absolute knowledge of reality is accessible only to God; according to Locke it is inaccessible to man. Further, as the appearable is the observable, it follows of necessity that whatever appears or occurs is known directly through observation alone rather than through reason or intuition. Since the method and the subject matter of a cognitive inquiry go together logically, Locke's historical way of knowing (observation) is obviously the methodological counterpart of Gassendi's historical (phenomenal) type of knowledge.

To summarize: Gassendi, as a would-be complete eclectic in philosophy, was, of course, neither an extreme empiricist (sensationalist) nor an extreme rationalist (apriorist) in theory of knowledge, but our focus here has been on how his "historical" conception of science, which is interpreted at bottom as a tentative and piecemeal empirical search for descriptive truths of fact about natural phenomena with only probable validity and without metaphysical import, sheds new light on Locke's "historical" conception of method as presented in the *Essay*.[13]

Even though we may possess no firm evidence as yet that John Locke, the English empiricist, borrowed the observational component of his method from Pierre Gassendi, the French empiricist, significant indirect evidence exists.[14] In any event, apart from the plausible assumption that Gassendi provides a missing link in the case that Locke makes for the observational method of inquiry, there is no doubt that the method

13. Gassendi's empirical canons of logic and his natural history method of approach to modern science are found amply illustrated in his major work, *Syntagma philosophicum*, published posthumously in the first two volumes of his *Opera omnia*, 1658 edition.

14. For instance, Locke's notebooks in Oxford at the Bodleian Library (B.L. MS. Locke f. 3, p. 178; B.L. MS. Locke f. 20, p. 233; B.L. MS. Locke d. 11, f. 289) and at the British Museum (now British Library) in London (B.M. Add. MS. 32,554, p. 22, p. 182) have some entries referring to Gassendi. Of all such entries, the most telling one is found at the Bodleian (B.L. MS. Locke d. 10, p. 155), where Locke links Gassendi with "Scepcis" [*sic*], that is, with Joseph Glanvill's *Scepsis scientifica* (1665) and the latter's reply to Catholic and Aristotelian critic Thomas Albius (pseudonym of Thomas White, 1593–1676).

itself takes its particular name and cue from *natural* history, whose modern revival came in the sixteenth century.[15] This revival of natural history as a field of scientific inquiry, the express aim of which is to confine itself to the facts and actual sequence of events via the accurate observation, description, and classification of the phenomena of nature, was reflected in the publication of numerous descriptive histories of clinical cases—a branch of natural history that doubtless was of special interest and concern to Locke the physician.

Once we consider the many works on natural history that were published before and during Locke's lifetime,[16] we can understand why his historical method turns out to be a broadly conceived observational or experiential way of knowing (*Essay*, II: 352, where the terms *experience*, *observation*, and *natural history* are actually juxtaposed and taken as synonyms), and why in addition his *Essay* polemically implies that the regular use of this method for all our factual inquiries (including, by extension, those on human knowledge, human nature, human society) is the only effective alternative to the speculative way of metaphysics, which, in his opinion, meddled with cognitive issues beyond human ken. In that connection Richard Aaron, a present-day Locke scholar, explains parenthetically that the term *historical* in the Lockean method is "a synonym for experimental or observational."[17] Inasmuch as *historical* in this method actually refers to the revived method of natural history, Aaron is right in saying that the term itself is a synonym for *observational*; but it is not clear whether *experimental* and *historical* (*observational*) are equivalent terms in Locke's own usage.[18]

Despite this possibly misleading ambiguity in the *Essay*, the question as to which of the two methods enjoys primacy is important for another reason connected with the story of British empiricism and with the entire evolution of modern science. Whereas Francis Bacon in the *Novum organum* (1620) viewed the observational method of natural

15. A. R. Hall, *The Scientific Revolution: 1500–1800* (Boston: Beacon Press, 1956), p. 300.

16. Consult John Harrison and Peter Laslett, *The Library of John Locke* (Oxford: Oxford University Press, 1965), for titles of works on natural history in his possession.

17. Richard I. Aaron, *John Locke*, 2nd ed. (Oxford: Clarendon Press, 1955), p. 78; it should be noted that Aaron here does not stop to explain what "plain" means in Locke's "historical, *plain* method" (italics added).

18. Compare *Essay*, II: 350, where the difference between observational (in the natural history sense) and experimental (in the strict technical sense) is implied, with II: 222 and 256, where apparently it is not.

history as merely a preliminary compiling stage of the mature experimental method of natural science, Locke in the *Essay* (1690) seventy years later not only looked at the historical or observational method of inquiry as the primary and indispensable way of knowing particular matters of fact, but he regarded it as sufficing the "conveniences of life" (*Essay*, I: 402). Besides, discounting the moral and legal problems involved in certain controversial areas of medical experimentation at any time, Locke's primacy on the older and less clearly conceptualized observational method of natural history may be accounted for by the limited development and mixed reception of the experimental method in biology and medicine in the seventeenth century, despite the work of William Harvey.[19]

It is of course well known that Locke's *Essay* opens with an attack on the doctrine of innate knowledge in order to prepare the way for his view that all knowledge is ultimately acquired from actual experience (in the comprehensive sense of the term). Much more significant, however, is his critique of the reasoning inherent in the concept of natural science as a demonstrative system of necessary truths about bodies in motion—a method followed by many of the greatest scientific innovators of the sixteenth and seventeenth centuries and vigorously defended by Descartes as the mathematical key to the basic laws of nature.

The ultimate goal of Locke's strategy was to show that, even though demonstrative or deductive reasoning is applicable to the universal truths of pure mathematics, it is not really appropriate to the concrete objects and contingent laws of nature, that is, to the probable generalizations of physics. Consequently, since we should adapt our methods of inquiry to the type of truth we search after, the new sciences of nature must adopt a different method suitable to their own factual investigations, namely, the rehabilitated natural history method of observation, if they are to make any discoveries of lasting benefit to mankind (*Essay*, II: 346–54).

19. See Hall, *The Scientific Revolution*, pp. 129–58, 275–302, for an account of the actual state of descriptive and experimental biology at the time.

That this fundamental lesson in comparative logic is the over-all purpose of the *Essay*, is not contradicted by the fact that Locke at times failed to apply his own method consistently throughout the text.[20] We may feel that he needlessly restricted the scope of his inquiry by starting with a defense of a scientific method that presumably was to be outmoded or surpassed in later times, but we must not forget that he did so deliberately because, as a doubting man of medicine and a member of the Royal Society during the English Restoration, he could not help being suspicious of any *a priori* approach to the study of nature that ignored the natural limitations of human understanding and indulged in idle speculation and sheer mathematical reasoning to compensate for its limitations.

In other words, Locke's contention in comparative logic is that, since "a perfect science of natural bodies" (meaning a wholly demonstrative system of nature) is not possible, physics must be satisfied with the less systematically ambitious status of a purely descriptive science of phenomena, the essential of which is the nondemonstrative but improvable method of observation or experience (*Essay*, II: 221–23, 217–18).

Locke has often been blamed for underestimating the mathematical aspects and possibilities of modern science. While this is true, he would still maintain steadfastly that physics is not and can never be a strictly exact science of nature, given the latter's contingency and human fallibility, including the fallibility of the scientist. Despite the subsequent and contemporary advances of mathematical physics, the old Cartesian dream of reducing physics to mathematics remains a dream to this day, with or without Werner Heisenberg's principle of indeterminacy operating in subatomic particles.

20. For Locke's comparative logic *in nuce* see his seminal journal entry of June 26, 1681 on ways of knowing, in R. I. Aaron and Jocelyn Gibb, eds., *An Early Draft of Locke's Essay, Together with Excerpts from his Journals* (Oxford: Clarendon Press, 1936), pp. 116–18, where an implicit distinction is made between the method of "demonstration" of the mathematical or moral sciences and the method of "history" or "experience" of the factual sciences, natural and social. The distinction itself is a pivotal one to Locke because it signifies that, contrary to Galileo and Descartes, physics ("natural philosophy") as the new guide of the modern mind is *not* a demonstrative science (cf. *Essay*, II: 350), it is merely an empirical science, like medicine. Witness how the entry's general image of natural science reflects unmistakably the particular empirical image of medical science in Locke the physician, as perfectly evident from his answer to the two illustrative medical questions raised there, that "whether rhubarb will purge or Quinquina cure an ague is only known by experience," that is, *not* by reasoning at all.

Having considered the documentary evidence for identifying the first aspect ("historical") of the Lockean method with observation or experience, we may proceed to do likewise for its second aspect ("plain"). In view of Locke's aversion to useless speculation and his preference for the useful knowledge of those things "which concern our conduct" (*Essay*, I: 31), the fountainhead of the evidence for rendering *plain* as practical is, of course, the *Essay* itself. Our interest here, however, is to submit other and much less familiar sources of evidence. This takes us from the scientific descent of Locke's historical, plain method to its medical ancestry, in which all three aspects of his method—the two explicit ("historical" and "plain") plus the implicit (sceptical or agnostic)—meet in their original medical context.

Aside from the direct sources of Locke's method in the medical world of the late seventeenth century and especially in the work of his friend Thomas Sydenham (1624–1689),[21] the method itself has ancient roots in the empirical school of medicine, which contended that the pre-Hippocratic Akron was the first empiricist.[22] The empirical school flourished during early Hellenistic times (c. 200 B.C.) and its largely observational approach to medical phenomena became allied with the virtually empirical type of scepticism that marked the final stage of the Greek sceptical movement in late antiquity (c. 150–200 A.D.).[23]

As may be learned from Galen and Celsus,[24] the empirical school (analogous to its British descendant in the 17th century) arose as a reaction against both the abstract and fanciful speculations of the old so-called dogmatic school and the anatomicophysiological minutiae of the new Alexandrian school. Its whole reaction against superfluous theorizing in medicine is epitomized in the statement of Celsus that what counts in medicine is not what produces the disease but what relieves it.[25]

21. See especially Romanell, "Locke and Sydenham," for the Sydenhamian sources of the Lockean method of inquiry appropriate to *the natural history of knowledge*—which is what the *Essay* is all about, essentially.

22. Ludwig Edelstein, *Ancient Medicine: Selected Papers of Ludwig Edelstein*, Owsei Temkin and C. Lilian Temkin, eds., C. Lilian Temkin, trans. (Baltimore: Johns Hopkins Press, 1967), p. 195.

23. R. G. Bury, editor and translator of Sextus Empiricus, *Outlines of Pyrrhonism*, 4 vols. (London: Heinemann, 1961), I: xxix–xlii, gives a brief sketch of the various periods in the history of ancient Greek scepticism.

24. Locke had no Galen in his personal library, but he did own a copy of the Basel, 1552 edition of Celsus, *De arte medica* (Harrison and Laslett, *The Library of John Locke*, p. 104).

25. Celsus, *De medicina*, trans. W. G. Spencer, 3 vols. (Cambridge: Harvard University Press, 1948), I: 21.

The Hellenistic medical empiricists and sceptics looked upon medicine as a practical art or craft that requires great skill and sound judgment.[26] The dogmatists, although supposedly akin to Hippocrates in ideology, trusted reason and theory, and strove to make medicine a demonstrative science by interpreting "the facts of pathology as links of a chain subject to a logical causal law."[27] In contrast, the empiricists argued that medicine could only achieve the cognitive status of a descriptive science founded directly on experience gained from medical practice alone, that is, on the accurate observation of clinical phenomena and the probable conclusions drawn therefrom. This explains their sceptical stance on matters inaccessible to clinical observation (such as the real nature and ultimate causes of health and disease) and their compensatory emphasis on the curative results of medicine as the practical way out of the ensuing scepticism.

The basic method of the school, traditionally labeled empirical but actually pragmatic in its final appeal to the physician's own practice as the acid test (utility) of medical theory, is not so simple in principle as it sounds on first hearing. In fact, its much disputed method of acquiring medical knowledge really involved three distinct but interrelated procedures to be followed scrupulously by the physician. Specifically, to arrive at useful truths, a physician must not only resort to medical analogies whenever unavoidably confronted with unfamiliar cases of illness, and must make and record his own empirical observations of clinical phenomena, but, in view of the first and foremost Hippocratic aphorism (*ars longa, vita brevis*), he must also avail himself of what is expressly called "history"—the recorded observations of predecessors and contemporaries who described the symptoms and natural history of individual illnesses and the corresponding remedies.[28]

In a word, the empirical school's method of medical inquiry, on which its therapeutics is said to be based, consists of an all-inclusive "tripod": *observation* (covering illnesses familiar to the physician himself),

26. Henry E. Sigerist, *The Great Doctors*, Eden and Cedar Paul, trans. (Garden City: Doubleday, 1958), p. 34.

27. Arturo Castiglioni, *Storia della medicina*, new ed., 2 vols. (Verona: Mondadori, 1948), I: 163.

28. Victor Brochard, *Los escépticos griegos*, trans. Vicente Quinteros (Buenos Aires: Editorial Losada, 1945), pp. 380, 442–48.

history (covering illnesses familiar to other physicians, past and present), and *analogy* (covering unfamiliar illnesses). The second of the three, *history*, constitutes the oral and written tradition of the profession itself.[29]

Locke's belief that his method of inquiry is essential and appropriate to all things "capable of observation and testimony" (*Essay*, II: 379) amounts to an elaboration and justification of the recourse of his Greek medical precursors to history as the only available and feasible way to check and supplement one's own clinical observations with those of other practitioners, handed down by tradition.

Locke's interest in the logical problem of determining the degree of probability of testimonies invoked in any factual inquiry (*Essay*, II: 375–79) parallels the concern of his Hellenistic medical colleagues with the same problem in medicine,[30] where the task of validating medical testimonies is not merely academic but is often a matter of life or death—than which there is nothing more practical. The affinity of his historical, plain method with the methodological tripod of the Hellenistic medical empiricists is not a mere coincidence of thought and language; Locke the practical empiricist (or pragmatist) in medicine stands behind Locke the practical empiricist (or pragmatist) in philosophy.

Three examples from his writings reflect the affinity to a remarkable degree, directly or indirectly. One of them is the revealing medical letter already cited, in which Locke highly recommends Sydenham's plain method of observation as a better way of attaining knowledge of the *phaenomena* or history of diseases in their changing aspects than the fanciful or "romance way of physick."[31] The reader should note how the implicit identification here of the terms *phaenomena* and *history* in a medical context is, impressively enough, reminiscent of their explicit equivalence in the more general scientific context of Gassendi's letter of 1641, discussed above.

In keeping with his very high opinion of the Sydenhamian method of medical inquiry and with his own sceptical reservations about our cognitive ability to establish a necessary connection between Nature's unperceived efficient causes of disease and their actual sensible effects on the body and its natural functions, Locke calls special attention to

29. Ibid, p. 448.
30. Ibid, p. 444.
31. Locke, *Some Familiar Letters*, p. 284.

our lack of certainty as to how the ways and tools of Nature affect our health. He concludes that there is nothing left for a physician to do under the circumstances but to follow Dr. Sydenham's medical method diligently. This method Locke explains in virtually the same terminology as that of the aforementioned tripod except that the collective term *history* is replaced by the individual term *memory*, its psychological equivalent.[32]

Another example is Locke's own generalized variant of the tripod on which the method of the Hellenistic school of empirical medicine stood. It is found in the *Essay*, Book IV, Chapter XVI, where he discusses and compares the various degrees of probability enjoyed by types of judgment pertaining precisely to propositions of the same trio: observation, history, analogy (II: 369–82). In harmony with the pragmatic character of the *Essay*, Locke says flatly that the more-or-less probable judgments or opinions belonging to the class of such trio lack the theoretical value of demonstrative certainty. At the same time, however, he insists on their practical necessity in the conduct of our lives, and the management of our great concerns, on the ground that the everyday affairs of life will not bear delay until all the evidence has been gathered (II: 371). It is interesting that Locke the practical physician in problems of therapy—which usually require immediate attention—is clearly reflected in Locke the practical philosopher in matters of probability.

We now come to the third and last example. In a medical letter which is clearer than the *Essay* on the matter in hand, Locke provided the best piece of evidence that the philosophical method used in his *Essay* is essentially pragmatic. Here he again paid tribute to the great Sydenham's efforts to use careful observation as a basis for the diagnosis and treatment of diseases. Locke defines this in neat normative terms as "the way of *accurate practical observation*"[33] (italics added).

The italicized words correspond exactly to Locke's own description of his "historical, plain method" as set forth in the *Essay*. This implied affinity of methods of inquiry in Locke and Sydenham can be traced, in the main, to their common origin in the methods of the Hellenistic

32. Cf. *Essay*, I: 166–82; II: 220–23, 260–63, to see how Locke's sceptical position as a medical doctor on the etiology of diseases gets expressed and generalized in the candid agnostic tone characterizing his causal theory of nature and "copy" theory of scientific knowledge.

33. Locke to Dr. Thomas Molyneux (Nov. 1, 1692), in *Some Familiar Letters*, p. 279.

empirical school of medicine. Thus, when Locke's method of inquiry, stated explicitly in the *Essay*, is viewed against the background of its various sources in medicine, including his own medicophilosophical writings,[34] it becomes clear that his historical, plain method is a *generalized* pragmatic method which originated in ancient medicine. This should not surprise us, especially since the pragmatic movement in America is one of Locke's closest philosophical heirs, as is conspicuously evident in the work of the physician-philosopher William James. Despite appearances to the contrary, the Jamesian pragmatic method—used as a new name for some old ways of thinking—has more in common with the Lockean historical, plain method than perhaps has ever been recognized hitherto, but a discussion of the comparative subject would take us beyond the scope of the present study.[35]

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34. Locke's medical manuscripts are preserved (for the most part) in the Public Record Office of London (among the Shaftesbury Papers), the British Museum, and the Bodleian Library (in the Lovelace Collection).

35. William James (1842–1910) counted Locke as one of the "forerunners of pragmatism" as a method of philosophy (*Pragmatism: A New Name for Some Old Ways of Thinking* [London: Longmans Green, 1907], p. 50). The author of the present essay only alludes in passing to their pragmatic temper as medical men in "Locke and Sydenham," p. 310, in "Medicine and Pragmatism in William James," *Connecticut Medicine* 39 (1975): 580, and in "Medical History in the Religious Psychology of William James," *Actes de XXV Congrès International Histoire de la Médicine*, Quebec, 1976, vol. 3, p. 1183.

ESSAY-REVIEW

CHAPMAN, ROGER G. and CLEVELAND T. DUVAL, eds. *Charles Darwin 1809–1882: A Centennial Commemorative* (Wellington, New Zealand: Nova Pacifica Publishing Co., 1982). 376 pages, illustrated. Price $585.00.

Reviewed by RALPH COLP, JR.

THIS large, sumptuously produced, profusely illustrated, and egregiously priced book, which commemorates the 173rd anniversary of Charles Darwin's birth and the 100th anniversary of his death, consists of eleven essays, mostly by specialists. In his introduction Roger Chapman, one of the editors, points to the recent enormous increase in the volume and depth of Darwin studies and to the growing interest in the history and philosophy of science. He asserts that the aim of this book is to be neither laudatory or iconoclastic, but to present a picture equal to the complexity of Darwin the man, his thought, and his times. Although the book has several shortcomings, most of the essays attain the goal set by Chapman.

The purpose of the present essay-review is to evaluate, summarize, and where possible elaborate upon some of the facts and ideas in this book in the three areas of Darwin's personality and biography, the development of his ideas, and the influence of these ideas. Then I shall comment on the illustrations and the price.

I

Mea Allan, in her essay "The Young Charles Darwin," sketches the development of some of Darwin's intellectual and emotional traits up to the age of 22 and his departure on the *Beagle*. His boyhood interests in gardening and in the naming of plants were shaped by his mother, father, and brother. His youthful interests and self-education embraced different natural sciences, such as marine zoology, entomology, and botany, which he pursued while he was studying medicine at Edinburgh, and then divinity at Cambridge. Because of this self-education he could qualify for the position of naturalist on the *Beagle*. He was passionately fond of hunting, walking, and observing scenery. He could laugh at others, always gently and inoffensively, and at himself—"he was never so serious that he could not poke fun at himself."

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Miss Allan's essay has several shortcomings. It makes no mention of such unpublished documents as the affectionate and revealing correspondence between Darwin and his three sisters, and the romantic letters written to him by Fanny Owen; Miss Allan, having worked with the Darwin papers at the Cambridge University Library, has certainly read these documents. It is stated that while at Edinburgh Darwin learned taxidermy from a negro who had traveled with Waterton, the naturalist, and that he first heard about the evolutionary views of Lamarck from his Edinburgh mentor Dr. Robert Grant. No mention is made of research which shows that the negro was John Edmonston,[1] and that at Edinburgh Darwin probably read Lamarck's first published statement on evolution.[2]

Miss Allan makes several statements about young Darwin's thoughts, and his interactions with his father, Dr. Robert Darwin, which are questionable or imprecise. "Charles," she writes, "had been wayward, and sought to still his conscience beneath an unusual display of filial affection. No one, he was sure, would know what he had done. He never forgot how his father turned on him and ordered him to confess his wrongdoing" (p. 41). This episode poses problems of source and veracity. The stated origin is a biography of Darwin which cites no primary source.[3] The episode does not seem to be in any of Darwin's recollections, or in the published and unpublished recollections about him by his sons Francis, William, and George, or in any other of the primary sources of his biography. If the incident is true, it was atypical of Dr. Darwin. The father's usual policy seems to have been to make light of the lies that Charles told him,[4] and not to insist that his son confess wrongdoing.

Another interaction of Darwin and his father is described as follows: "Dr. Darwin would sometimes take him [Charles] on his chaise when on his professional rounds, and would point out the wild birds and other

1. R. B. Freeman, "Darwin's Negro Bird-Stuffer," *Notes and Records of the Royal Society of London* 33 (1978): 83–86.

2. Darwin read Lamarck's *Système des animaux sans vertèbres, ou tableau général des classes, des ordres et des genres de ces animaux* (Paris, 1801), which contained a lecture by Lamarck delivered at the Musée National d'Histoire Naturelle, on May 12, 1800. In this lecture Lamarck first publicly enunciated his evolutionary views; Frank N. Egerton III, "Darwin's Early Reading of Lamarck," *Isis* 67 (1976): 452–56.

3. Geoffrey West, *Charles Darwin: A Portrait* (New Haven: Yale University Press, 1938), p. 48.

4. Nora Barlow, ed., *The Autobiography of Charles Darwin* (London: Collins, 1958), p. 23, note 2.

creatures seen in the fields and along the country roads. Charles was quick at picking up such knowledge" (p. 41). The source for this is Darwin's recollection at the age of eight and one-half years: "I remember . . . often going with my father in his carriage, telling him of my lessons, & seeing game & other wild birds which was a great delight to me.—I was born a naturalist."[5] This recollection, which says nothing about Dr. Darwin pointing out objects to his son, suggests that while Darwin was dutifully telling his father about school work, he was also feeling independence from father and school and was silently delighting in the observation of nature.[6]

The essay "H.M.S. 'Beagle' and the Peculiar Service," by David Stanbury,[7] describes the voyage of the *Beagle* from the viewpoint of British naval history. This richly informative essay explains how the development of hydrographic research, which led to changes in the Hydrographic Department of the Admiralty and to changes in British policy toward the new revolutionary republics in South America, were responsible for the *Beagle's* "peculiar service" as a surveying ship. A detailed account, reconstructed from diverse sources, is given of the physical appearance of the *Beagle* and of the cramped living conditions during the five years of the voyage: "two people—often three—might be working together, ship (and perhaps stomachs) heaving at tasks as diverse as dissecting a jellyfish in a dish under a microscope and charting a convoluted coastline, all this on a table hardly larger than the chart itself. And Darwin, continually seasick, had to clamber over the chart table to seek the relative comfort of his hammock" (p. 92). Darwin learned to adapt to these conditions. He later told his son Francis that it was the absolute necessity of tidiness in the cramped space of the *Beagle* that helped to give him his methodical habits of working.[8] Despite the crowding Darwin got on amiably with the crew, although there were occasional quarrels with Captain Robert FitzRoy. The officers are

5. Ralph Colp, Jr., " 'I was born a naturalist': Charles Darwin's 1838 Notes about Himself," *Journal for the History of Medicine* 35 (1980): 28.

6. Ibid., pp. 28–31. This contains a discussion of the early relation between Darwin and his father.

7. Stanbury is identified only a "a consultant to the BBC/Time-Life" for the television series *The Voyage of Charles Darwin* (p. 4). He is the author of several articles on the *Beagle*, and the editor of *A Narrative of the Voyage of H.M.S. 'Beagle'* (London: The Folio Society, 1977). At present he is writing the definitive history of the voyages of the *Beagle*.

8. Francis Darwin, ed., *The Life and Letters of Charles Darwin*, 2 vols. (New York: D. Appleton, 1896), I: 193.

shown to be "a powerful, almost distinguished" set of young men who "took a great interest in all of Darwin's work, and must in turn have had a great influence on him" (p. 83). Five later became admirals.

Stanbury summarizes the varied naval accomplishments of the *Beagle* as follows: "Captain FitzRoy and the *Beagle* indeed helped to extend the bounds of empire by properly establishing the settlement at the Falkland Islands, and upholding the tenuous authority of the government resident in New Zealand. They settled traders' compensation claims in Tahiti and became actively involved in South American revolutions. They were attracted by the possibilities of settlement and profit in the convict colonies of Australia and Tasmania, and they explored new areas for exploitation in the Galapagos Islands and on the island of Chiloe. They demonstrated that their converted 'coffin ship' could be sailed safely in some of the most dangerous areas of the world. They gave their support and encouragement to the widespread missionary enterprises masterminded from Europe. . . . They collected priceless anthropological and ethnographical material, and made an early contribution to setting down, in written form, difficult native languages. Their meterological observations joined a bank of largely ignored data, but the effort did enthuse the man [FitzRoy] who one day was to bring order out of that chaos. The magnetic observations were of little use, but the tidal details began a new line of research. The Beaglers also rescued shipwrecked mariners and transported suspects and prisoners. FitzRoy . . . returned with pages of detailed sailing directions, masses of soundings, and hundreds of charts of the coast of South America. It is no wonder that the merchants of Lima sent their thanks and the Royal Geographic Society awarded its gold medal to Robert FitzRoy in recognition of his outstanding contribution to geography and to science" (p. 98).

During the voyage Darwin made geological and zoological observations which then, as Stanbury puts it, "helped to fuel a lifetime of research and speculation."

For most of his post-*Beagle* life Darwin was ill. He suffered mainly from upset stomach. His symptoms were caused by anxieties, especially anxieties over his theory of evolution. His main nurse and caretaker was his wife. Redmond O'Hanlon, in "Darwin the Man: An Overview," describes Darwin's marriage as follows: "She appeared to give him security in all emotional matters, care in all physical; inside Darwin's own outer defences against the world—the air of humility which

actually marked a mind absent without leave from the trivia of the moment to be at work on its own great project, the socially retiring modesty which his visitors often mistook for genuine simplicity—she helped him to build an equally impressive inner enclosure: a devoted encirclement by consistent love and meticulously attentive nursing. Yet he knew very well that his theoretical work was an anathema to its ostensible protector. He knew that some part of the essentials of happiness . . . would always be denied to him" (p. 28). Did these marital difficulties cause him anxieties which, at the very moment his wife was nursing him, exacerbated his gastric symptoms? O'Hanlon does not ask this question. It probably cannot be answered by available evidence.

O'Hanlon observes that some of Darwin's most prominent characteristics were "high energy, perseverance, courage," and "a bold and original imaginative power" (p. 11). These qualities were not always apparent. Darwin's courage has been described, not unfairly, as "very human, cautious, vacillating, yet persistent."[9] Further traits mentioned by O'Hanlon and some of the other essayists and then listed in the *Commemorative*'s special "Darwin Index" include: Darwin's rigid daily routine of alternate periods of work and leisure, and habitual daily dosage of snuff (p. 32); his friendships with his scientific colleagues (p. 34); his extra-scientific life at Down House; and his Victorian identity, as "a typical independently wealthy, reform-minded squire" (p. 188). Darwin aficionados, who argue over the exact meaning and chiaroscuro of each trait, would insist on mentioning many additional traits. These would include: his rigorous yet tender home education of his children; his seemingly confused and contradictory—"parenthesis within parenthesis"—way of talking about a scientific topic to a new acquaintance; the mixture of raillery and deference that he showed in conversing with women visitors; his compulsion to conserve time in his experimental work—he would work with extreme rapidity, and then suddenly stop, saying "I believe I mustn't do any more[10]; and his recently documented tastes for non-scientific, factual literature—history, accounts of foreign travel, biographies, and autobiographies.[11] Other traits will probably be revealed as the complete correspondence is published and as some of the assertions in his *Autobiography* are revised.

9. Howard E. Gruber and Paul H. Barrett, *Darwin on Man: A Psychological Study of Scientific Creativity* (New York: E. P. Dutton, 1974), pp. 5–6.

10. *Life and Letters of Charles Darwin*, I: 117–18, 121.

11. L. Robert Stevens, "Darwin's Humane Reading: The Anaesthetic Man Reconsidered," *Victorian Studies* 26 (1982): 51–63.

II

Darwin's early scientific work was mainly in geology. Sandra Herbert, in "Remembering Charles Darwin as a Geologist," shows how this geological work was viewed in 1909, in the fiftieth anniversary of *The Origin of Species*, and the 100th anniversary of Darwin's birth, by Sir Archibald Geikie and John Judd, two English geologists who had known Darwin. Both Judd and Geikie stressed Darwin's ideological debt to Charles Lyell and to Lyell's book *Principles of Geology* and concept of geological uniformitarianism, and also noticed the role of Lyell in Darwin's development as an evolutionist. Although these views are correct as far as they go, they omit much of importance in Darwin's intellectual development. Professor Herbert first shows how Darwin was stimulated by being a member of the London Geological Society in the 1830s and 1840s. At this time the Society's members were English gentlemen who added geological field work to their customary hunting, walking, riding, and travel; and the Society was "the outstanding center of scientific activity in England" (p. 239). The fruitful scientific conversations held during meetings of the Society are aptly compared with Isaiah Berlin's account of talks during the meetings of the Oxford philosophers a century later. It is shown, by a study of unpublished geological manuscripts, that Darwin's geological work dealt not only with the extension of Lyell's uniformitarian views and the identification of fossiliferous strata, but that Darwin was very ambitious intellectually and was intent on developing a theory of "simple geology." This theory, which held that there was a direct relation between one part of the globe rising and another part subsiding, is summarized as follows: "Darwin's simple geology was to be based on a full understanding of the vertical movement of the earth's crust (he did not consider the possibility of horizontal movement) . . . Darwin used Lyell's ideas more boldly than Lyell himself. Where Lyell thought of crustal movements as taking place over relatively small areas and as measuring in the hundreds of feet, Darwin thought of them as affecting much larger areas, continents even, and as measuring in the thousands of feet" (pp. 255–56).

Simple geology led Darwin to formulate his theory of the origin of coral reefs, which is generally accepted today, and then his theory on the origin of the parallel roads of Glen Roy, which soon became discredited when the existence of ice-age glaciers became known. Darwin's Glen Roy failure, which he came to regard as the greatest

blunder of his career, caused him to withdraw from geology and to stop working on his theory of simple geology. "Today," writes Professor Herbert, "ideas of crustal movement—now horizontal rather than vertical—are once again to the fore . . . Darwin . . . would have been satisfied. Indeed, we may remember Darwin not only for . . . his authorship of the *Origin of Species*, but also as one who set forth an ideal, albeit a temporary failed ideal, for a simple geology based on a proper understanding of movement of the earth's crust" (p. 258). Professor Herbert's essay is essential, not only for seeing Darwin as a geologist, but for understanding his development as a scientific thinker.

Some of the theological factors which motivated Darwin to create his theory of natural selection are discussed by Roger Chapman in "Darwin the Scientist and His Science." Chapman shows that Darwin was influenced by the place of natural theology in early nineteenth century British science, and especially by the Reverend William Paley's book, *Natural Theology*. Paley regarded organic nature as "empirical reality," and he applied to it a mechanical view: "I contend that there is mechanism in animals . . . that this mechanism is intelligible and certain . . . [and] it demonstrates intention and contrivance."[12] *Natural Theology* then gave a compendium of the many ways in which organisms are perfectly adapted for their existence in nature, "all of course being seen as contrivances evidencing a [Divine] Contriver" (p. 126). Paley had read Malthus's *An Essay on the Principle of Population* but then minimized the conflict and struggle which Malthus had stressed; and he saw no relation between struggle and adaptation. Darwin learned from Paley to view nature as an "empirical reality," and he sought naturalistic answers for the perfect adaptations catalogued by Paley. "Whereas Paley only saw the variety of adaptations as enhancing the wisdom, goodness, and power of Divine Providence, Darwin sought a different kind of unity within the diversity of the organic world" (p. 126). Then Darwin read Malthus *On Population* and he connected struggle with adaptation. "The synthesis or mediation of struggle and adaptation," writes Chapman, "was for Darwin the hypothesis of natural selection, and through it nature took on a unity such as never before had been possible" (p. 130).

12. William Paley, *Natural Theology* (1802; reprinted in *The Complete Works of William Paley*, 4 vols., London, 1825) 3: 50.

Although others have touched on Darwin's debt to Paley,[13] Chapman's views are especially well documented and well argued. However, in the course of discussing Darwin's reaction to reading Malthus—it was the most creative reaction that Darwin would ever have—Chapman does not mention the different interpretations that scholars have given.[14] Nor are these interpretations discussed in the two other accounts of Darwin's reading of Malthus that are included in the volume under review (pp. 150, 267). Nowhere in the volume is there a discussion of Darwin's creativity, and the words "creative" and "creativity" are absent from the index.

Mea Allan's "Charles Darwin and the Botanical Sciences" regrettably omits to discuss the work done by Darwin before *The Origin of Species* which elucidated the ways by which particular species of plants and animals had migrated across natural barriers, such as oceans and mountain ranges, and settled in new lands. These migrations of species had resulted in their present geographical distribution. Darwin had declared to his friend Hooker that geographical distribution was "that almost keystone of the laws of creation" (p. 261).

Darwin was often frustrated by this research on species. It involved experimentation and hard reasoning, and no one had ever attempted it. After discussing it with Hooker he would frequently suffer episodes of "violent eczema in the head during which he was hardly recognisable."[15] Eventually he was able to formulate plausible ways of migration, and he included these in the important chapters of *The Origin* which discuss geographical distribution.

Most of "Darwin and the Botanical Sciences" is devoted to Darwin's botanical work which followed the *Origin of Species*. It is shown that work with plants brought out several of Darwin's deepest emotional and

13. Loren Eiseley, *Darwin's Century* (Garden City, N.Y.: Doubleday, 1958), pp. 183–84; M. L. Clarke, *Paley: Evidences for the Man* (London: SPCK, 1974),pp. 97–99; D. L. LeMahieu, *The Mind of William Paley: A Philosopher and his Age* (Lincoln: University of Nebraska Press, 1976), pp. 177–81.

14. Some of the interpretations of Darwin's reaction to Malthus are in Gruber and Barrett, *Darwin on Man*, pp. 161–64; Dov Ospovat, *The Development of Darwin's Theory* (Cambridge: Cambridge University Press, 1981), pp. 60–73 and note 3 on p. 247; Silvan S. Schweber, "The Origin of the *Origin* Revisited," *Journal for the History of Biology* 8 (1977): 229–316; and Ernst Mayr, "Darwin and Natural Selection: How Darwin may have Discovered his Highly Unconventional Theory," *American Scientist* 65 (1977): 321–27.

15. Ralph Colp, Jr., *To Be an Invalid: The Illness of Charles Darwin* (Chicago: University of Chicago Press, 1977), pp. 31–32.

intellectual attributes. He felt affection for plants, regarded them as "fellow beings," and sometimes "fused together his admiration for the structure of a flower with his appreciation of its beauty" (p. 259). He was an unusually perceptive observer of plants. His botanical experiments were often ingenious in conception and were carried out meticulously so as to control all factors (p. 283). It is worth noting that because of his botanical experiments the word "control" entered the literature of experimental biology.[16] More might have been said about his penchant for testing ideas that others did not consider worth testing, and for performing "fool's experiments."[17] Miss Allan describes his seven botanical books—*The Various Contrivances by Which Orchids are Fertilised*, *The Variation of Animals and Plants under Domestication*, *Climbing Plants*, *Insectivorous Plants*, *The Effects of Cross- and Self-Fertilisation in the Vegetable Kingdom*, *The Different Forms of Flowers on Plants of the Same Species*, and *The Power of Movement in Plants*—and explains how each supplied evidence of natural selection. She then summarizes the importance of Darwin's botanical work in two sentences: "The keynote was survival. He was able to demonstrate in plants evidence of the great principle of his theory: not only descent, but advantageous variations accumulated in a process of modification, which enabled species to succeed in the struggle for existence" (p. 289). She observes that, because of the questions he asked, his work created new branches of botany. Her essay, despite its omissions, is one of the best essays on Darwin as a botanist.[18] For the detailed and definitive work on this subject there the reader may wish to consult her book *Darwin and his Flowers: The Key to Natural Selection.*[19]

16. Edwin G. Boring, "The Nature and History of Experimental Control," *American Journal of Psychology* 67 (1954): 573–89, 571.

17. *Life and Letters of Charles Darwin*, I: 126; E. Ray Lankester, "Charles Robert Darwin," in *The Warner Classics: Philosophers and Scientists* (New York, 1899), pp. 29–30.

18. Two other revealing essays are Francis Darwin, "The Botanical Work of Charles Darwin," *Annals of Botany* 13 (1899): ix–xix and Nora Barlow, "Darwin as a Botanist," in P. G. Wanstall, ed., *A Darwin Centenary* (London: Department of Botany, British Museum [Natural History], 1961), pp. 13–25.

19. Mea Allan, *Darwin and his Flowers: The Key to Natural Selection* (London: Faber & Faber, 1977). An American edition is published by University of California Press, Berkeley. In this book, Chapter 10, "The Great Migrations," gives an account of Darwin's work on species migrations.

Howard Gruber and Robert T. Keegan, in "Darwin and the Human Sciences," have boldly attempted to organize their essay around four basic themes, each of which has a double title: (a) sexuality and love; (b) variation and individualism; (c) chance and selection; and (d) struggle and progress. For each theme the authors deal with the pre-Darwinian situation, with Charles Darwin's thought, and with its historical consequences. Their attempt is bold because many of the ideas they discuss are ill defined, and because sometimes, as in their discussions of variation and individualism and of chance and selection, there does not seem to be a meaningful relation between Darwin's thought and its contemporary counterpart.

However, the discussions of love and sex, struggle and progress, are informative and insightful. When Darwin wrote about love he gave information "as to how it is expressed not how it feels" (p. 297). He viewed love as an "inherited habit," and also as a "social instinct" which, because it existed to a greater degree in humans than in animals, had been a force in evolution (pp. 297–98). He viewed human sexual interaction as an unmitigated good which performed a dual role in evolution. First, "sexual beings produce numerous offspring, these offspring compete, and this struggle results in the natural selection of those most suited to the conditions of life." Then Darwin's theory of sexual selection opened up his theory of natural selection by explaining how a certain characteristic becomes transmitted from generation to generation, by a mechanism which is not directly linked to individual survival. Gruber and Keegan show how these ideas of Darwin were elaborated by prominent nineteenth century thinkers and then used by Freud, who "had direct knowledge of Darwin's work as well as the benefit of elaboration by others," to form some of the main tenets of psychoanalysis (p. 302). Aside from Freud there is no discussion of how Darwin's ideas influenced psychiatrists and psychologists.[20]

The themes of struggle and progress are discussed as follows. "To Darwin struggle was our inevitable inheritance but not our penance .... In the older catastrophist view struggle was the prelude to death. But Darwin believed that struggle was the mechanism of gradual adaptive change. In this gradualist framework, changes accumulate only if they work for the good of the organism. Struggle, in this view of life, was the

20. Howard E. Gruber, "Darwin on Psychology and Its Relation to Evolutionary Thought," in R. W. Rieber and Kurt Salzinger, eds., *Psychology: Theoretical-Historical Perspectives* (New York: Academic Press, 1980), pp. 145–74. This essay is not mentioned in the *Commemorative*.

mechanism of perfectibility" (p. 314). And where *Homo sapiens* was concerned, Darwin "wanted to believe in progress" (p. 317). Today "there are theories by which change is mediated by a sort of dynamism that might be thought of as a struggle, but which represents the activity of a self-regulating system striving to maintain itself by constantly re-adapting its behaviour to meet changing circumstances. Such 'equilibration models' are found in the writings of Herbert Spencer, Jean Piaget, and of course modern cyberneticians" (p. 316). And "today we are far less certain about progress than Darwin and his Victorian contemporaries.... Much of what passes for scientific and technological progress has contributed to a prospective set of conditions that may make life impossible for our species—the death of the oceans, the destruction of the atmosphere, and suicidal thermonuclear war" (pp. 317–18). On this pessimistic note "Darwin and the Human Sciences" closes.

III

"In the half century after the publication of Darwin's *Origin of Species* the idea of evolution captured the imagination of thinking people throughout Europe and America. Enthusiastically applied in such seemingly diverse fields as anthropology, biology, criminology, economics, geology, philosophy, psychology, sociology, the idea appears to have exercised an almost talismanic influence over the age" (p. 133). So writes John R. Durant in his "The Great Debate: Evolution and Society in the Nineteenth Century."

Durant believes that this Darwinian revolution (it would be worth knowing when this term was first used, and by whom) was caused by a broad intellectual transformation that occurred in nineteenth-century England. After 1850 the "all-embracing philosophy of 'scientific naturalism' " began to emerge. This was a cosmology which Huxley described as: "harmonious order governing eternally continuous progress—the web and woof of matter and force interweaving by slow degrees, without a broken thread, that veil which lies between us and the Infinite—that universe which alone we know or can know."[21] This cosmology welcomed the appearance of a biology which stated that

21. T. H. Huxley, "The 'Origin of Species' " (1860), in *Collected Essays*, 9 vols. (London, 1893–94) 2: 59.

"living organisms possess a genuinely natural history." "It was in the name of naturalism in general," writes Durant, "rather than of Darwinism in particular, that many Victorians took up the idea of evolution" (p. 136).

Durant then describes the way in which Herbert Spencer, Francis Galton, Alfred Wallace, and Darwin applied different concepts of evolution to human society. To Darwin there was a difficult dilemma: "On the one hand, human reason and compassion were the products of evolution, but on the other they threatened to undermine it by interfering with the operation in society of the process of natural selection. Man . . . was part of nature . . . yet he disobeyed natural laws" (p. 155). After Darwin the Fabian socialists developed "an evolutionary social theory in which the idea of group selection and the organic analogy played a major part" (p. 160); and Karl Pearson, the biometrician, wrote that a nation should keep up its efficiency by recruiting its members from "the better stocks," and by warring on "inferior races" (p. 162). The ideas of the evolutionary naturalists differed widely because concepts which they regarded as scientific were (unknown to them) loaded with implicit cultural meaning.

"What on earth," asks Durant, "is social Darwinism?" He defines it as "any post-Darwinian evolutionary social theory which makes use of the notions of struggle for existence and survival of the fittest." And he points out that: "Running through the literature on this subject over the past century has been a persistent thread of uncertainty about what the term really means" (p. 157). Today the term *social Darwinism* is still very much in use, especially in America,[22] and a new term, *financial Darwinism* has appeared.[23]

Until very recently it was believed that the publication of *The Origin* had been followed by "warfare" between the camps of science and religion. In 1979 Dr. James Moore, in his book *The Post-Darwinian*

22. Jack Newfield, "What's Better than Social Darwinism and Greed? Justice, for One Thing," *The Village Voice*, March 2–8, 1983; Howard F. Stein, "Neo-Darwinism and Survival Through Fitness in Reagan's America," *The Journal of Psychohistory* 10 (1982): 163–87.

23. Charles Schumer, "If Financial Darwinism is Allowed to Prevail," *The New York Times*, May 7, 1981, p. A34. Mr. Schumer, a member of Congress from New York, was raising questions about financial policies of the Reagan administration. Another term, *medical Darwinism*, has been used to describe the movement of doctors from areas of physician saturation to areas of physician need; see J. Ronald Rowes, "One of 'Too Many Doctors' Finds his Niche," *The New York Times*, August 31, 1983, p. A26.

Controversy,[24] showed that this belief is erroneous, and that instead of warfare between camps there had been complex interactions between individuals, and a crisis in the minds of many intellectuals. Now in his essay, "1859 and All That: Remaking the Story of Evolution-and-Religion," Moore states that during the decades preceding *The Origin* there had been radical criticism of Christianity and of the chief doctrines of the Victorian creed. Different new creeds were formed, and when *The Origin* appeared it generated conflict between them. This conflict was primarily about the identity and character of moral authority in a changing society. The issue was: "Were the clergy to go on controlling people's lives . . . or would professional men of science now take the lead in reforming the social order. . . ?" (p. 192). The men of science were not necessarily antitheistic, and in time a new alliance was formed between the clerical and scientific professional elites.

This new alliance showed itself when Darwin died and his scientific friends obtained permission from religious dignitaries for his burial in Westminster Abbey. Moore describes Darwin's funeral as follows: "Darwin's body was borne mightily up the nave . . . in the procession followed an unprecedented assemblage of distinguished scientific men. It was their apotheosis as much as Darwin's. It was the rising generation reaching full stature. It was the young reformers reaching old age. It was the Trojan horse of naturalism entering the fortress of the church" (p. 194). Moore's essay is finely thought out and firmly grounded in primary and secondary sources. It shows empathy and sympathy for different ideological positions. It is the best introduction to the history of the interaction of Darwinism and religion.

R. J. Berry, in "Darwin and Evolutionary Biology," summarizes objectively a great number of complex and controversial ideas so as to recount the history of the main scientific objections to, and debates over, the theory of natural selection. During Darwin's life an early objection, still extant, was that natural selection could only remove inefficiencies but could not produce novelty or seemingly perfect adaptations. Darwin first replied to this objection in the first edition of *The Origin* (he later wrote that his ability to anticipate criticisms was one

24. James R. Moore, *The Post-Darwinism Controversies: A Study of the Protestant Struggle to Come to Terms with Darwinism in Great Britain and America, 1870–1900* (Cambridge: Cambridge University Press, 1979). This is the most objective and comprehensive book that has yet appeared on the interaction between evolution and theology.

of the main reasons for *The Origin*'s success[25]), and he made further replies in the five successive editions. His replies have been documented in Morse Peckham's *Variorum Text* of *The Origin*[26] (the *Variorum*, however, is not mentioned anywhere in the *Commemorative*). In the 1920s research by geneticists yielded new evidence for the power of natural selection to produce adaptations. Berry asserts that this and other research has strengthened the replies made by Darwin.

In the half century after 1882 there were bitter debates, first between biometricians and Mendelians, and then between paleontologists and geneticists, as to how evolution had taken place, and whether the evolutionary process had been continuous or discontinuous. The majority of biologists became disenchanted with Darwin's theory. In 1932 the American biologist T. H. Morgan stated that "natural selection did not play the role of a creative principle in evolution" (p. 208). At this time, however, Darwin was still lauded for "his influence on the general cultural development of humanity."[27] But ten years after Morgan's statement "all but a very few biologists were agreed on an evolutionary theory based firmly on Darwin's own ideas knitted with subsequent developments in genetics" (p. 208). This came about because individuals in previously competing research traditions, notably experimental geneticists, naturalists, and systematists, came together and pooled information and ideas, and then created a "neo-Darwinian synthesis" (p. 208).

In the decades following this formulation, new ideas on how evolution has occurred, and on how natural selection needs to be revised, have been debated, together with concepts of neutralism, cladism, and punctuated equilibria, and biologists on all sides of the debates have viewed with alarm the revival of creationist ideas in America. Berry believes that some of the ideas of neutralism, such as those which consider the maintenance of variation and the interaction of genes with ecology, as well as the influences of punctuated equilibria on processes of speciation, will be absorbed into the neo-Darwinian synthesis; and that this synthesis "is in good shape . . . with no need for any major new synthesis to incorporate the attacks of the 1980s" (p. 229). Most biologists would agree with this.

25. *The Autobiography of Charles Darwin*, p. 123.

26. Morse Peckham, ed., *The Origin of Species by Charles Darwin: A Variorum Text* (Philadelphia: University of Pennsylvania Press, 1959).

27. Eric Nordenskiold, *The History of Biology* (New York: Tudor, 1928), p. 476.

However, it seems certain that in the future there will be further objections to natural selection and further debate about it. For as Ernst Mayr, who has probably witnessed more of the vicissitudes of Darwinism than any other living biologist, has noted: "Darwinism has encountered . . . much greater and more broadly based opposition than any other well established scientific theory."[28] Why is this so? An obvious reason, stated frequently by Darwin, is that evolution cannot be observed directly. Berry points out that objections to natural selection "have in every instance . . . arisen because of confusion about the nature and maintenance of inherited variation" (p. 197); and that the common characteristic of all past and current attacks on evolution "is an overemphasis on one particular factor or failure to take into account data from disparate disciplines. Difficulties in this respect increase as biological knowledge grows, and it becomes difficult to keep different parts of the subject in focus" (p. 229).

But even more so, despite the plausible and powerful answers of Darwin, Berry, and others, there remains the difficulty of imagining how natural selection can produce novelty and adaptation. A physician and biologist who has studied the history of evolutionary thought has recently expressed this difficulty as follows: "Evolution by natural selection is counter-intuitive . . . I do not believe that any biologist, no matter how convinced an evolutionist, really finds it easy to understand the actual processes by which animals, with their astonishing adaptiveness, have in fact evolved. There are just too many steps. Can one really envisage how the eye, with all its complex structures, arose by 'chance' changes that were selected for? It must be a facile biologist who, in his heart of hearts, has no doubts. What persuades the biologist is the overwhelming evidence . . . and the absence of any alternative. We may be convinced by the fossil evidence, by the genetics, and by the absence of the inheritance of acquired characteristics, by geographical isolation. We accept, but are we happy?"[29] This is a deeply felt passage; but, as Berry has observed, the theory of natural selection has "raised emotions" ever since it was published (p. 197).

28. Ernst Mayr, "Epilogue," *Biological Journal of the Linnean Society* 17 (1982): 115.

29. Lewis Wolpert, "The Multiplication of the Living," *The Times Literary Supplement*, March 4, 1983, p. 216.

In the last essay in the volume under review, "The Darwinian Legacy: A Philosophical View," Michael Ruse, a philosopher and Darwin scholar,[30] examines the relation between Darwinism and several currents of modern thought. Seeking to show how Darwinism and contemporary science can achieve a fruitful interaction, Ruse first postulates that, although different scientific theories have different elements, they are united in their conformity to certain underlying rules—what philosophers call regulative principles. However, says Ruse, these regulative principles cause us to think only in the limited ways that the principles allow; and these ways become less convincing in a world of non-Euclidean logic and Heisenberg's uncertainty principle.

He then suggests: "that we substitute a Darwinian backing. We think in certain ways—ways reflected in our science as conformity to regulative principles—because this is the biologically advantageous thing to do. In this way, Darwinism helps us to understand the nature of science, and why it is as it is . . . when we do change principles . . . we do not just change willy-nilly. Rather, in modern science we adopt new types of understanding so we can protect the most basic principles. Thus, for instance, Heisenberg's uncertainty principle saves us from breaking the law of non-contradiction, in saying that an electron is really simultaneously both a particle and a wave. Moreover, in everyday life we still keep to the old principles. . . . What I suggest is that we adopt the American philosophy of *pragmatism*. Regulative principles, as burnished by natural selection, work" (p. 332). "Darwinism," Ruse adds, "does not make our scientific beliefs right or wrong in some absolute sense. But Darwinism does make us believe what we believe, because such beliefs 'work.' Thus an evolutionary pragmatism is all we can have—and all we need" (p. 333). These views are in the tradition of John Dewey, the American philosopher and pragmatist. In an address at Columbia University Dewey had stated that *The Origin of Species* had "introduced a mode of thinking that in the end was bound to transform the logic of knowledge" (p. 2).[31]

30. Dr. Ruse is Professor of History and Philosophy at the University of Guelph, Ontario, Canada, and author of *The Darwinian Revolution: Science Red in Tooth and Claw* (Chicago: University of Chicago Press, 1979).

31. The complete text of Dewey's important address is contained in John Dewey, "The Influence of Darwin on Philosophy," in Philip Appleman, ed., *Darwin: A Norton Critical Edition* (New York: W. W. Norton, 1970), pp. 393–403.

Ruse then criticizes the evolutionary theories of the American Stephen Jay Gould and the French Jesuit Teilhard de Chardin as attempts to modify Darwinism so that it will reinforce a particular ideology. He believes that "if one is to be both a Christian and a Darwinian," then "one must live with the fact that God works through a slow, wasteful, cruel, natural process . . . one *must* live with the painful blindness of selection" (p. 341).

Ruse's severest criticism is directed against the "scientific creationists," who claim that their Bible-based creation theory is vastly superior to the theory of evolution. He shows that this claim is unsubstantiated scientifically. He further argues that, because creationism is based on an appeal to authority and religion, it is morally pernicious and opens the possibility that, if successful in their beliefs about the physical world, the creationists could then "conceivably introduce horrible, biblically backed claims about the inferiority of women, blacks, and homosexuals" (p. 350). Because of the tendentiousness of creationist ideas that is a possibility which, however unlikely, is not inconceivable.

Ruse and most of the other essayists stress the vitality, durability, and wide applicability of Darwinism. The most concise overview of the influence of Darwinism, formulated by Ernst Mayr and quoted here, states: "it is only since Darwin that we realise that every biological phenomenon and process requires at least two explanations, including a purely functional one and an evolutionary one" (p. 230).[32]

Nowhere in the *Commemorative* is there an account of non-Darwinian biologists. Mayr has observed: "In the 80 years after 1859, the non-Darwinian biologists were decidedly in the majority. In fact in some countries, France for instance, there were virtually no true Darwinians."[33] During these years most of London's prestigious biological societies, and some biological sciences such as taxonomy, were unaffected by Darwinism.[34] John Gould, an acquaintance and near contemporary of

32. This statement was made when Mayr's article was still in press. The final published version reads: "It was through Darwin that we have come to realize that every biological phenomenon and process requires at least two explanations, a purely functional one and an evolutionary one, and that evolution has two major components, changes in adaptation and changes in diversity"; see Mayr, "Epilogue," p. 125.

33. Ibid., p. 120.

34. Frederick Burkhardt, "Darwin and the Biological Establishment," *Biological Journal of the Linnean Society* 17 (1982): 42–43.

Darwin, who became England's most popular and productive ornithologist, was silent about Darwinism.[35] Biologists could have successful careers while remaining outside the Darwinian revolution.

IV

The *Commemorative* contains almost 160 pictures—more than any other Darwin book except *Darwin and the Beagle*, which has almost 190.[36] The pictures include paintings, engravings, drawings, sketches, photographs, and sculptures, and mostly fall into three categories: portraits of individuals, pictures of places and individuals in place settings, and caricatures and cartoons.[37]

The portraits of Darwin convey poignantly the changes in his appearance and demeanor occasioned by his illness and work. As a fairly healthy, bright, and promising young naturalist, he appears pleasant and amiable. In middle age, very ill and racked and tormented by the manifold difficulties of his evolutionary theory, he is taut, tense, and contorted with pain. In old age, less ill, "the Aristotle of our days," he is serene. There is a photograph of Darwin with one of his young children, usually identified as his son William, but here for some undetermined reason thought perhaps to be his daughter Annie. There are good portraits of his Darwin and Wedgwood relations, his wife, friends and teachers, and the authors of the books which shaped his thinking. And there is a rare aquatint sketch of a meeting of the members of the London Geological Society, when he was an active member. Although the faces of some of the members are quite distinct—Lyell is definitely present and perhaps Darwin is across the table from him—no attempt has been made to identify some of the

35. Gordon C. Sauer, *John Gould the Bird Man: A Chronology and Bibliography* (Victoria, Australia: The Craftsman Press, distributed by University Press of Kansas, 1982), pp. xvii–xviii.

36. Alan Moorhead, *Darwin and the Beagle* (London: Hamish Hamilton, 1969). Other books which contain pictures on Darwin and his times are Julian Huxley and H. B. D. Kettlewell, *Charles Darwin and his World* (New York: The Viking Press, 1965); Editors of *Horizon Magazine* and Walter Karp, *Charles Darwin and The Origin of Species* (New York: American Heritage Publishing Co., 1968); and Richard Darwin Keynes, ed., *The Beagle Record: Selections from the original pictoral records and written accounts of the voyage of H.M.S. Beagle* (Cambridge: Cambridge University Press, 1979).

37. Unfortunately, some of the authors were not able to see galley proofs of their articles and were not consulted about the captions of the pictures which pertained to these articles.

members. There are, regrettably, no pictures of Darwin's children as adults, especially his five distinguished sons, and no picture of Alexander von Humboldt, famous author of *A Personal Narrative of Travels to the Equinoctial Regions of the New Continent during the Years 1799–1804*, which deeply influenced Darwin before and during the cruise of the *Beagle*.

Two rare contemporary sketches show the exterior of Shrewsbury School and the interior of the school's book-lined library, where Darwin was forced to study Greek and Latin classics. He may have learned more from this classical education than he was willing to acknowledge. There are several good contemporary pictures of universities and other places, in Edinburgh and Cambridge, where Darwin sojourned, and a humorous sketch by his friend Albert Way lampooning his bumptiousness as a beetle collector. It would have been interesting to have included a photograph of the tomb of his paternal uncle Charles Darwin.[38]

The pictures that pertain to the cruise of the *Beagle* contain some errors and are uneven. "A finely detailed painting of the midshipmen's berth aboard H.M.S. 'Beagle,' by Augustus Earle" (p. 85) is *not* HMS *Beagle*. It is too large, too high, and contains far too many midshipmen. It was painted by Earle in 1820 and is of the British frigate HMS *Hyperion*. An engraving of "H.M.S. *Beagle* in the Straits of Magellan" (p. 86), gives a picture of the *Beagle* which is wrong in almost every detail except the number of masts! The picture was in an 1890 edition of the *Voyage of the Beagle*, drawn from imagination by a Mr. Pritchett. There is a small reproduction of a print of a Brazilian forest, which should have been larger, so as to show details, and should have been identified as the

38. Darwin's full name was Charles Robert Darwin. His paternal uncle was named Charles Darwin. Charles Darwin died in his twenty-first year at Edinburgh University as he was about to receive the diploma in medicine. He had been much loved and respected by University officials, and he was buried in the family vault of Professor Andrew Duncan, in Buccleuch Parish Church, Edinburgh. On his gravestone the following eulogy was inscribed: "Charles Darwin died at Edinburgh, May 15th, 1778. He cultivated with Success, the Friendship of Ingenious Men, and was buried by Favour of Dr. A. Duncan in this his Family Vault. 'Fame's Boastful Chissel, Fortune's Silver Plume, Mark but the Mouldering Urn, or Deck the Tomb.' " When Darwin was 16–18 years old he was a medical student at Edinburgh, and lived only three blocks from Buccleuch Church. He also met the aged Professor Duncan who spoke to him about his uncle. The memory of his uncle must have had a depressing influence on him and may have caused him to stop attending his medical courses.

work of the German artist Maurice Rugendas.[39] Darwin was deeply and lastingly impressed by the forest. Its multitude of different animals and plants first delighted and bewildered him, then reduced his mind to "a chaos of delight" (p. 33). He and FitzRoy thought that the forest was best depicted in the pictures of Rugendas.[40] There is a surfeit of pictures of Tierra del Fuego and the Fuegians, but there is no detailed picture of the forest of Tierra del Fuego. Darwin's notes on this forest seem to anticipate the famous "tangled bank" ending of *The Origin of Species*.[41] There is, however, a picture of a forest on the island of Chiloe, off the coast of Chile. There is a good picture of a native New Zealand woman and her two children, but alongside this picture there is an uncaptioned picture of a Fuegian.[42] There are good pictures of the Falkland Islands and the Pacific atolls. There are no pictures of Argentine Indians and gauchos, Tahitians, and Australian aborigines, all of whom figured in Darwin's thoughts. There are good reproductions, from the *'Beagle' Zoology*,[43] of the birds (*Rhea darwinii* and the Galapagos finches) and fossils which influenced his evolutionary thinking. There are two pictures of Darwin's simple Coddington microscope, given him by his Cambridge friend Herbert and then used by him during the voyage; but there are no pictures of his geological hammer,[44] which he once called his companion.[45]

39. This same picture, identified as being the work of Rugendas, is reproduced in two books that touch on aspects of Darwin's career: Victor Wolfgang Von Hagen, *South America Called Them: Explorations of the Great Naturalists, LaCondamine, Humboldt, Darwin, Spruce* (New York: Knopf, 1945), p. 236; and Robert S. Hopkins, *Darwin's South America* (New York: Day, 1969), p. 51.

40. Ralph Colp, Jr., review of Keynes, *The Beagle Record*, in *Bulletin of the New York Academy of Medicine* 57 (1980): 264.

41. Duncan M. Porter, "Darwin's missing notebooks come to light," *Nature* 291 (1981): 13.

42. Both of these pictures were originally reproduced, and correctly identified, in Robert FitzRoy, *Narrative of the Surveying Voyages of H.M.S. Beagle* (London: Henry Colburn, 1839), I: frontispiece and p. 568.

43. Charles Darwin, editor and superintendent, *The Zoology of the Voyage of H.M.S. Beagle under the Command of Captain FitzRoy R.N., during the years 1832 to 1836* . . . (London: Smith Elder & Co., 1840–43).

44. A picture of a geologist's hammer is given in *Horizon* and Karp, *Charles Darwin and the Origin of Species*, p. 28. It is not certain, however, that this is the hammer that Darwin used during the voyage.

45. For a discussion of Darwin's feelings for his hammer see Ralph Colp, Jr., "Charles Darwin's Vision of Organic Nature: 'A force like a hundred thousand wedges,' " *New York State Journal of Medicine* 79 (1979): 1622–24.

There is a photograph of the restored house on 12 Gower Street, now renumbered and part of University College, London, where Darwin and his wife began their marriage, but the wrong date is given for the air raid in World War II which destroyed the original house.[46] There is a good contemporary picture of Burlington House, headquarters of the Linnean Society, where the theory of natural selection was first announced publicly, but there is no picture of the Athenaeum Club, where Darwin was able to advance his thinking by conversing with some of England's leading intellects.[47] There are several good plans of Down House and its estate, and the village of Downe, and a vibrant watercolor of part of Down House and its garden, but there is no picture of the sandwalk, on Down estate, where Darwin took regular daily walks and did some of his scientific thinking.[48] There are good pictures of some of the plants with which he experimented and of his Down estate greenhouse, but no pictures of the animals he described and dissected—notably barnacles and pigeons—and no picture of the London Zoo, where in the 1830s and 1860s he made interesting observations on apes. It would have been worthwhile to have included pictures of at least some of the following places: the hydropathy establishment at Malvern, where Darwin went for treatment,[49] the grave of his daughter Annie at Malvern,[50] and the houses of some of his friends and relations where he went for holidays or convalescence.[51]

46. The *Commemorative* states that the Gower Street house "was destroyed in an air raid in 1940" (p. 30). The destruction occurred during an air raid on April 16–17, 1941. The raid has been considered the worst on London during the war in terms of "weight of bombs dropped, casualties inflicted, and the number of fires caused." T. H. O. O'Brien, *History of the Second World War. Civil Defence* (London: H.M.S.O., 1955), p. 416.

47. For an account of Darwin and the Athanaeum Club see Silvan S. Schweber, "Darwin and the Political Economists: Divergence of Character," *Journal for the History of Biology* 13 (1980): 259–60.

48. A picture of the sandwalk is given in *Horizon* and Karp, *Charles Darwin and The Origin of Species*, pp. 146–47.

49. Pictures of the Malvern hydropathy building are shown in Colp, *To Be an Invalid*, pp. 66–67, and Robert Olby, *Charles Darwin* (Oxford: Oxford University Press, 1967), pp. 32–33.

50. Darwin took his daughter Annie for treatment to the Malvern hydropathy establishment in the spring of 1851. She died at Malvern, in the company of her father, in April, 1851, and was buried there. Darwin wrote a moving memoir of her and often recollected her traits. In 1863, when he was very sick and a patient at Malvern, he thought of Annie and his wife visited her grave.

51. Some homes that Darwin frequently visited are Leith Hill Place, home of his cousin Josiah Wedgwood III and sister Caroline; two houses at Hartfield Sussex which were the

The *Commemorative* displays an exceptionally diverse and revealing collection of caricatures and cartoons. In 1871–72, after Darwin published his *Descent of Man* and *The Expression of the Emotions in Man and Animals*, showing that humans had evolved from lower forms, a number of cartoons portrayed him as an ape. One of the most famous of these appeared in *The Hornet*. It depicted a great gorilla, having Darwin's head and face, standing by the trunk of a tree, and grasping a club with one of its feet. The picture was captioned "A Venerable Orang-Outang. A Contribution to Unnatural History." An American, James Hague, reported that Darwin showed him this picture and then commented: "The head is cleverly done, but the gorilla is bad: too much chest; it couldn't be like that." Referring to the cartoons about him, Darwin told Hague: "I keep all these."[52]

The most famous and often reproduced human caricature of Darwin appeared in *Vanity Fair* in September, 1871, and is here reproduced in its original color, in a full page (p. 351). It shows Darwin sitting on a chair, propped up on cushions, dressed in somber brown and black, crossing his long arms and legs, and flashing an impish smile. Except for the quality of his smile this picture portrays Darwin as he appeared to visitors.[53]

Other cartoons show the Victorians' fear of superfecundity and overpopulation, and the plight of poor women and children. A series of cartoons suggests that as a result of Darwinian "selection" humans will acquire wings and learn to fly. Then there is a very large color cartoon, folded to fit on a page. It is titled "Our National Church." Its stated aim is to give "an accurate bird's eye view of the relations of the National Church and its Parties with the outside Sects, Heresies and Schools of Thought to each other." In the center, under the tent-like dome of St. Paul's Church, cluster the white-robed figures of the Anglican Church.

homes of his cousin Charlotte Wedgwood and his aunt Sarah Elizabeth Wedgwood; 7 Park Street, London, home of his brother Erasmus; Hopedene Surrey, home of his cousin Henseligh Wedgwood; and Abinger Hall, home of Thomas Farrar. In later years he sometimes stayed at the homes of his sons William and Horace and his daughter Henrietta.

52. James Hague, "A Reminiscence of Mr. Darwin," *Harper's New Monthly Magazine* 69 (1884): 760.

53. In 1872 a visitor to Down House described Darwin as "sitting up on a cushion in a high chair, very erect, to guard his weakness." Emma Brace, ed., *The Life of Charles Loring Brace, chiefly told in his own letters* (New York: Charles Scribner's Sons, 1894), p. 320.

Ranged around them are many diverse figures, so many that only a few can be mentioned. Figures of "Dissent," including Quakerism and Wesleyanism, pull on the Anglican figures. To one side stand the red-robed figures of Cardinals Manning and Newman, and nearby is a sign pointing to Rome. Beneath the ground stand the figures of Political Atheism, represented by the MP Bradlaugh; and Pius Mountebankism, represented by General Booth of the Salvation Army. To one side Huxley, Spencer, and Tyndall, holding banners of Science and Philosophy, march away from the Anglican center. They are led by a grinning ape waving a red banner of Darwinism. Ahead of them is a rising sun, obscured by a cloud labeled Protoplasm. To one side of this is an effigy of Darwin. This cartoon, perhaps more than any other single document, summarizes the main currents of Victorian thought after the *Origin*. The author and date of this cartoon are not mentioned.

V

The *Commemorative* is a book divided against itself.

Its scholarly authors have written not only for other scholars but for a large, unspecialized audience. However the producers of the book—the Nova Pacifica Publishing Company—have aimed at producing a volume which is composed of expensive materials, priced at $585, limited to 750 copies,[54] and obviously intended mainly for wealthy book collectors. Most individuals and most libraries interested in Darwin will not be able to buy it.

It is hoped that the present limited edition will soon be distributed successfully and that the publisher will then collaborate closely with the different authors and produce a cheaper edition. The informative book deserves a wide audience.

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54. In a letter of March 29, 1982, to prospective buyers of the *Commemorative*, Nova Pacifica wrote: "a shortage of some of the high quality materials has restricted the edition [of the *Commemorative*] size to only 750 copies instead of the 1,000 copies originally intended. This will however add to the rarity of the work."

Ave atque Vale Saul Jarcho

THIS issue of *Transactions and Studies* is the last under the editorship of Saul Jarcho. Dr. Jarcho, together with Dr. Ronald Kotrc, the former director of the Francis Clark Wood Institute of the History of Medicine, can be credited with actually resurrecting and invigorating this oldest continuously published medical journal in America.

Saul Jarcho brought to his task a powerful background in medicine, in history, and indeed in the broad field of the humanities. He also brought a literary talent and a rich experience as editor of the *Bulletin of the New York Academy of Medicine* from 1967 to 1977. Under his wise, energetic, and devoted leadership during the past five years, *Transactions and Studies* has aroused growing interest among the world of medical scholars while gaining distinction as a medical historical publication.

The Fellowship of the College of Physicians is proud of his accomplishment and deeply grateful to Dr. Jarcho for his generosity and able leadership of this venerable journal during a critically important period of its life.

Brooke Roberts, M.D.
President

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ESSAY-REVIEW

INKSTER, IAN and MORRELL, JACK, eds. *Metropolis and Province, Science in British Culture, 1780–1850.* Philadelphia: University of Pennsylvania Press, 1983. 288 pages. Price $30.00.

Reviewed by JOHN HARLEY WARNER

IT is not self-evident that early nineteenth-century medical practitioners should have been particularly interested in basic science. Yet it is a simple fact that many medical men were strongly attracted by science and were active in its institutions. Furthermore, this enterprise was not at all confined to biological subjects. During recent years historians of nineteenth-century Anglo-American medicine have become increasingly curious about this phenomenon, and have asked a series of recurrent questions concerning the physician's interest in science. While it is unsurprising that the medical *practitioner* pursued sciences which he believed had direct application to his art, such as anatomy, botany, and meteorology, what did he expect to gain from the study of topics like geology, electricity, and astronomy? What was the benefit he anticipated by joining in the scientific work of a lyceum or literary and philosophical society? Beyond the technical requirements of his daily routine, why did he care about science?

It is not the explicit purpose of the essays that comprise this volume to answer these questions, but most of these studies share a task that overlaps these concerns. The volume is therefore very suggestive for the historian intrigued by the physician's perception of the value of science. The stated objective of the collection is to provide "a new analytical framework for understanding the popularity of scientific culture in Britain during her early industrialization and urbanization." Science became widely diffused and enthusiastically pursued by various strata of British society both in London and in the provinces during the early decades of the nineteenth century. Why, the editors ask, did the Manchester mill owner, Bristol clerk, Edinburgh shopkeeper, London physician, and Norwich general medical practitioner participate so energetically in their local scientific societies? And what does that participation reveal about the place and function of science in British culture?

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In answering these questions, the editors self-consciously dissent from a traditional economic interpretation of science's appeal, by which they mean the notion that scientific interest was a direct response to the growing technical demands of the Industrial Revolution. Ian Inkster's introductory essay, a model of the kind of synthetic piece that should preface a volume of collected essays, sets forward clearly the unifying themes and objectives of these papers. Their common historiographic starting point is the assumption that social processes and cultural forms, including the burgeoning of scientific institutions in early nineteenth-century Britain, can not all be reduced to economics. Inkster asserts that the attempt to account for the attraction to science in terms of its "industrial utility" has failed. Science, he argues, was perceived by Britons as a cultural—not just economic—resource, and therefore what is needed is a "social history of scientific culture." The individual essays exemplify this research program.

There is nothing intrinsically novel about Inkster's proposal to go beyond economic reductionism. The authors of these essays are taking part in an ongoing discussion about the popularity of science in the late eighteenth and early nineteenth centuries that has been especially vigorous during the past decade. The leading alternative to the economic or "technical utility" explanation has been formulated most lucidly in an essay by Arnold Thackray that, tellingly, nearly all of the contributors to this collection cite.[1] Having made a prosopographical study of the membership of the Manchester Literary and Philosophical Society, Thackray maintains that the underlying motivation for scientific involvement was the search for social identity and status. By participating in scientific organizations, such socially marginal groups as Dissenters, manufacturers, and general medical practitioners sought to set up a new standard of social legitimacy, to forward their position in society by means alien to those of traditional British culture—church, education, and family connections. At the core of this "marginal man" model is the proposition that science was cultivated more as a means of cultural affirmation than of technical advancement. Other historians have suggested that scientific participation could be employed as a vehicle for social mobility within the existing order, rather than for the creation of an alternative value system. Scientific culture could also be used to defend the social status of those already well established. All of these

1. Arnold Thackray, "Natural Knowledge in Cultural Context: The Manchester Model," *American Historical Review* 79 (1974): 672–709.

models are grounded upon the conviction that a satisfactory explanation for the blooming of scientific activity in early nineteenth-century Britain must focus primarily on the desires of participants to increase or preserve social status, and to defend or assail the existing order of society.

What is most impressive about the essays that comprise this collection is the way in which they bring theoretical sophistication together with empirical richness. Each of the eight case studies scrutinizes institutional expressions of science in a very limited local context within early or mid-nineteenth-century Britain. A central objective in most of the essays is to assess the perceived value of science. In his study of Bristol, for example, Michael Neve shows that the town's scientific culture was not supported by marginal groups seeking social legitimation or advancement. Instead, scientific interest developed within established culture, which it strengthened, and functioned to maintain the dominance of the social elite. Paul Weindling similarly found an explanation based upon the aspirations of marginal groups inapplicable to the activities of the British Mineralogical Society, in which science was used to defend the social status of well-entrenched groups. The Society's members were largely apothecaries, chemists, and pharmaceutical manufacturers, whose studies were principally motivated by the perceived practical utility of mineralogy for their occupations, and its promise to maintain their professional success. On the other hand, Jack Morrell discovered in his study of the Geology and Polytechnical Society of the West Riding of Yorkshire that while the notion that geological knowledge was useful for mining was attractive, it was ultimately incompatible with the belief of local mining entrepreneurs that secrecy was necessary for financial success.

Different groups could be drawn to the same scientific association for divergent, potentially divisive reasons. As Steven Shapin points out, this was the case for the Edinburgh Philosophical Association. At first the interests of the local petite bourgeoisie who constituted and controlled the Association harmonized with those of its paid scientific lecturers, and with the ambitions of the phrenologist George Combe, who was influential in founding the Association. But when Combe planned to subvert the interests of the local membership by using the organization to advance his own aspirations for the diffusion of science on a national scale, the Association's directors ousted him. Derek Orange also found a polarization of interests and objectives in the

Newcastle Literary and Philosophical Society, which led eventually to the creation of alternative scientific institutions. His study focuses on the two factions within the Society's membership, one aiming to make the group into a scientific society, the other seeking to establish a literary reading club. Both essays reinforce the point that diverse lures attracted participants to scientific societies.

Other essays range more broadly in their themes, but share a preoccupation with social status. Michael Durey, in the only explicitly medical study of the volume, suggests that the 1832 cholera epidemic gave provincial practitioners an opportunity to display to society the value of their scientific acumen through its application to the control of cholera. But they were stymied in this endeavor on two fronts. Instead of encouraging their local boards of health to confront cholera boldly, community leaders commanded physicians to suppress reports of the disease in order to preserve commercial health. Furthermore, patients dampened scientific enthusiasm by resisting therapeutic experimentation. In his study of Londoners engaged in scientific lecturing, J. N. Hays is likewise interested in the ways in which scientific men sought approbation and financial security. This occupation, along with medical practice, involvement with industrial technology, and being a gentleman, was a leading source of support for London's scientific community. The performances of lecturers in the provinces increased London's domination of the national scientific life, creating what Hays terms "the London lecturing empire." Analyzing the reform movement at the Royal Society that culminated between 1846 and 1848, Roy M. MacLeod takes issue with the notion that it can be explained merely as one event in the "professionalization" of science, and instead stresses the operations of group interests, personal aspirations, and the politics of patronage. He argues that between 1830 and 1850 the London scientific establishment, like its medical establishment, sought to justify its social status by elevating its intellectual character. Reform was driven by a challenge to a traditional elite of wealth and rank by those of smaller means but greater philosophical ability.

Underlying the diversity of subjects and conclusions of these essays is the tacit assumption, made explicit by Inkster's introduction, that the perceived practical applicability of scientific knowledge is insufficient as an explanation for the efflorescence of scientific interest in early nineteenth-century Britain. What is especially striking to the medical historian is the close parallel between this historiographic plea to go

beyond the industrial or economic utility approach in explaining the appeal of science and the pronounced movement in medical historiography of recent years to go beyond the "clinical utility" approach in explaining the attraction of science for medical practitioners. These historiographic movements have by no means been isolated one from the other. But the contributors to this collection, while recognizing that medical practitioners figured prominently in the leadership and audience for scientific culture, do not by and large single out the medical man for special scrutiny. Still, this collection of essays has heuristic value for the historian whose special fascination is medicine.

The reasons nineteenth-century Anglo-American medical practitioners saw scientific knowledge as valuable can be divided into four artificial but perhaps crystallizing categories of possible motivations, which will be called here the *utilitarian*, *professional*, *explanatory*, and *personal*. Of these, the essays in this volume deal predominately with the first two, which correspond roughly to desires for occupational utility and status respectively. All four motivations, and their interactions, are important for a balanced understanding of the medical practitioner's participation in scientific culture.

The most apparent motivation for the medical practitioner to study science was its assumed *utilitarian* value. The medical man expected scientific knowledge to make him more effective at the bedside. Practitioners who trusted in the clinical application of science studied anatomy, chemistry, and physiology as applied sciences in the same way that some mine owners pursued geological knowledge. To be sure, throughout the nineteenth century there was a concomitant vein of skepticism about the practical medical relevance of basic science. For example, Gerald Geison has recently noted that many American physicians in the late nineteenth century doubted the practical worth of experimental physiology, and has suggested that perhaps the skeptics were right.[2]

The essays in this book bear down hardest on a second motivation, the *professional*. Simply put, scientific associations offered forums for solidifying identity and elevating status. The authors emphasize the fact that medical practitioners were prominent in the leadership and audience of early nineteenth-century Britain's science movement, and

2. Gerald L. Geison, "Divided We Stand: Physiologists and Clinicians in the American Context," in Morris J. Vogel and Charles E. Rosenberg (eds.), *The Therapeutic Revolution: Essays in the Social History of American Medicine* (Philadelphia: University of Pennsylvania Press, 1979). pp. 67–90.

are sensitive to the incentives scientific participation offered the practitioner. Sometimes the incentives they identify are patently economic—as in MacLeod's observation that some contemporaries ridiculed the initials FRS appended to a medical man's name as "Fees Raised Since"—while others are social and psychological. Thackray, after all, stressed the critical role that medical practitioners played in the Manchester Literary and Philosophical Society, showing that they were prominent among the marginal men therein seeking social legitimation. Taking Thackray's model as a starting point, Inkster has elsewhere demonstrated how medical men in Sheffield used participation in voluntary associations, including those of science, as vehicles for improving their marginal status.[3] Despite these seminal studies of Britain, however, historians of American medicine have given scant attention to the participation of physicians in nonprofessional associations and its meaning.

A third appeal of science for the medical man was its *explanatory* power. Even when scientific knowledge did not alter the practitioner's ability to prevent or cure disease, it could have value in expanding his understanding. Science provided an explanatory framework within which the physician could both account for the phenomena of disease and justify his actions, sustaining himself and his patient's family by drawing on the authority of science. Regarded in this way, science did not necessarily have to increase the physiological efficacy of the practitioner's enterprise to be of unmistakable worth. Nevertheless, to the extent that explanation itself constitutes a form of control, science did give the practitioner one source of power over illness, and of reassurance to patients and to himself.

Science engaged in for its explanatory value could subserve functions similar to those sought by practitioners spurred by utilitarian or professional motives. Explanation could make a practical difference at the bedside. Medical efficacy in the nineteenth century can not be judged solely by criteria laid down by the twentieth-century pharmacologist, as Charles Rosenberg has pointed out,[4] and it is not unreasonable to expect that intellectually and emotionally satisfying scientific

3. Ian Inkster, "Marginal Men: Aspects of the Social Role of the Medical Community in Sheffield 1790–1850," in John Woodward and David Richards (eds.), *Health Care and Popular Medicine in Nineteenth Century England: Essays in the Social History of Medicine* (London: Croom Helm, 1977), pp. 128–163.

4. Charles E. Rosenberg, "The Therapeutic Revolution: Medicine, Meaning, and Social Change in Nineteenth-Century America," *Perspectives in Biology and Medicine* 20 (1977): 485–506.

explanations of disease and therapy, consonant with society's growing faith in science, may have had genuine clinical worth. In an exceptionally illuminating account of the medical relevance of scientific knowledge in the Anglo-American context, S. E. D. Shortt suggests that what medical men chiefly gained from the scientific advances of the nineteenth century was the ability to explain disease in an impressive language (that of science), which was gaining in cultural authority.[5] Scientific knowledge thus augmented the status of the profession as a whole even though it did not confer greater ability to intervene effectively in disease. Viewed from this perspective, whether the scientific interests of medical men were motivated by a desire for status or for understanding, the result was a potent explanatory idiom that furthered professional uplift.

A final motivation for the medical practitioner's study of science was its *personal* worth, a benefit that is too often overlooked by historians striving to understand status and group action in socioeconomic terms. For much of the nineteenth century medical practice was a leading source of support for the person whose overriding desire was to follow a scientific career. But more than this, many medical practitioners plainly pursued science even when they neither sought to increase their socioeconomic status by doing so, nor thought that it would necessarily make them better able to vanquish their patients' ills. Science, like other categories of learning, could be explored for reasons of curiosity, self-culture, and self-image. This was science cultivated not for what it could do for the profession, the patient, or the practitioner's own standing, but rather for his own life.[6]

It is well to note the incentives for eschewing science in the early nineteenth century as well as embracing it. Indeed, it is somewhat surprising that none of these essays even mentions the persistent theme of ambivalence toward science in the nineteenth century, suggesting perhaps that both the appealing and repellent images projected by science pressed themselves more insistently upon medical men than upon laymen. In medicine, while the explanatory power of science was one motivation for scientific activity, it was also a serious cause of

5. S. E. D. Shortt, "Physicians, Science, and Status: Issues in the Professionalization of Anglo-American Medicine in the Nineteenth Century," *Medical History* 27 (1983): 51–68; see also Barbara G. Rosenkrantz, "The Search for Professional Order in 19th Century American Medicine," in *Proceedings of the 14th International Congress on the History of Science* (Tokyo, 1974), pp. 113–124.

6. See Saul Jarcho, "The Physician as Scholar," in John B. Blake (ed.), *Centenary of Index Medicus, 1879–1979* (Bethesda: National Library of Medicine, 1980), pp. 105–114.

professional despondency. Many medical men shared the perception that even though knowledge about disease was advancing rapidly, the practitioner's ability to intervene effectively was not keeping pace. This was a continuing source of frustration and clinical cynicism respecting the worth of, for example, such medical sciences as bacteriology and experimental physiology. Further, the alternative to an active interest in science was not apathy alone, as these essays tacitly assume, but could be hostility. Underlying medical men's evaluation of the value of science throughout the nineteenth century was the fear that excessive zeal for science could vitiate a man's character as a practitioner. This undercurrent was an important factor in the Anglo-American physician's evaluation of medical science in its changing forms—rationalistic systems, pathoanatomical knowledge of the Paris clinical school, and products of experimental laboratory science—during the nineteenth century. In any given period, some eminent physicians argued that interest in science must be tempered by a primary allegiance to healing: *Cui bono?* was to be the practitioner's leading question in assessing science.

This book is a paean for the power and necessity of local history, and in this may rest its most important message for the medical historian. It displays a diversity of motivations for scientific interest and activity that could only be discerned by looking hard at both the shared and idiosyncratic motivations of individuals acting within concrete, local contexts. Shapin, in his essay, comments on the current state of the social history of science in Britain that "a highly detailed empirical focus is often found associated with antiquarianism, and, conversely, pretensions to theoretical profundity with empirical vacuity. However, certain generally valuable historiographic perspectives can only be sustained by the use of a high-resolution microscope." To understand the question of what British and American medical practitioners believed science offered them, and to go beyond overarching generalizations generated by what Shapin calls " 'lazy' historical practice," the medical historian will have to focus his or her microscope upon the motivations of individuals acting in defined local contexts. The example of this volume predicts that any answers worth hearing will be both multiple and complex.

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ESSAY-REVIEW

HIRSCH, RUDOLF, ed. *A Catalogue of the Manuscripts and Archives of the Library of the College of Physicians of Philadelphia.* Philadelphia: Francis Clark Wood Institute, The College of Physicians of Philadelphia and The University of Pennsylvania, 1983. 259 pages, illustrated. Price $30.00.

Reviewed by MANFRED WASERMAN

A SENSE of pleasant anticipation often accompanies the study of a newly published catalogue. Not only can one appreciate the historical sources that have survived the vicissitudes of time, but the orderly listing of collections allows one to locate materials of special interest. And when the work is also a handsome publication which includes several fine illustrations, as is the case with this guide, it is indeed welcome.

The Library of the College of Physicians of Philadelphia originated with a gift of books and manuscripts donated by John Morgan one year after the College—the country's oldest extant nonlicensing medical society—was founded, in 1787, by Morgan, Benjamin Rush, John Redman, and William Shippen. The new catalogue of the Library's manuscripts and archives lists 1139 collections, and includes an index of persons and organizations as well as an index of subjects. It also contains an historical introduction by Whitfield J. Bell, Jr., and a brief explanatory note by Christine A. Ruggere, curator of the Historical Collections. An interesting addition is a list of approximately 200 donors known to have contributed to the growth of the Library's holdings since it was founded.

The archives and manuscripts collections of the College are an unusually rich source of research material for scholars in the history of medicine. The Library contains not only the archives of the College—including the 1788 draft of the College charter drawn up by Benjamin Rush—but also a fine selection of records from other professional societies and institutions. While most of these documents are from Philadelphia organizations, there are also some from other cities as well as from societies of national scope, including the American Association for the History of Medicine. Considering the importance of Philadelphia

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in the history of American medicine, it is apparent what a valuable resource these holdings are for study of the institutional history of medical societies.

The archival materials form only a small part of the Library's collections. The bulk of the manuscript holdings consists of volumes of lectures and notes of lectures, medical recipe and remedy books, prescription ledgers, commonplace books, collections of correspondence, groups of autographs containing hundreds of letters from physicians, as well as miscellaneous collections of single items, some of them of exceptional historical interest. Most of these materials range from the eighteenth century well into the twentieth. Among the many well-known names found in these papers are those of William Cullen, Joseph Black, William and John Hunter, Benjamin Rush, Caspar Wistar, Benjamin Smith Barton, Nathaniel Chapman, Elisha Bartlett, Philip Syng Physick, Daniel Drake, Oliver Wendell Holmes, Florence Nightingale, Joseph Henry, Baron Cuvier, Joseph Leidy, Frederick Banting, Alexis Carrel, Fielding H. Garrison, William Osler, William H. Welch, and Peyton Rous. While the majority of the manuscript collections are of American origin, many of the eighteenth century materials, not surprisingly, are British.

Among other British holdings is a 1684 autopsy report on Charles II. The Library's collection also includes some medieval medical and pharmaceutical documents, and numerous items from seventeenth through nineteenth century France, Germany, and Italy. And there is a selection of interesting miscellaneous items, such as a thirteenth-century astrological calendar and a 1717 Mexican decree pertaining to unqualified persons practicing medicine and surgery illegally.

The catalogue has an alphabetical arrangement, the archival and manuscripts collections being interfiled; the entries, listed in the form in which they were catalogued, are numbered sequentially. The contents of each collection are described briefly. This format is quite satisfactory, since a published catalogue of a Library's holdings differs from an unpublished finding aid to a particular collection of archives or manuscripts. In essence, it can be no more than a general guide which lists collections and implicitly invites scholars to select and pursue primary sources relevant to their research.

In bibliographical works of this kind it is not uncommon for an occasional typographical error to sneak in. The present reviewer made no systematic effort to find them, but a few errors were caught. In the

index, Alexander Agassiz's year of birth should read 1835, not 135; in the Harrison Allen entry (p. 3), where one is directed to "see also" entry number 936, the reader finds instead a second "934"; and the caption for plate 5 (p. 133) refers the reader to entry number 624, instead of number 625, a mistake repeated in the list of illustrations.

Such errors are not major, but there is an organizational aspect of the *Catalogue* which is somewhat troublesome. Why does the index fail to note the names of persons and organizations listed as main entries and the names cited in the "see also" notes of these entries? By using three different methods for locating references—that is, the numbered main entry, the "see also" entry, and the names appearing in the index—the possibility of error was enlarged. Thus, W. B. McDaniel, II, whose name appears in the entry filed under "Collection of Letters in Honor of . . ." (item 184) does not appear in the index and therefore, for reference purposes, is lost. And Caspar Wistar, who is referred to in the William Tilghman entry (item 1026) and therefore, I believe, should have been entered in the index, was omitted from that list. Another example pertains to the "Yellow fever" entry (item 1127) where William Currie was cited in the index, but Samuel Powell Griffitts, David Hosack, and Caspar Wistar were not. All in all, it probably would have been more efficient for the catalogue to have had one index listing all names, with boldface or underlined reference numbers to indicate the principal collections.

There are innumerable reasons why catalogues to collections of manuscripts and archives vary. One cannot, for example, expect a guide to holdings that were accumulated during two hundred years to be the same as a catalogue to collections developed during the past fifty years. Since there is no substitute for thoroughness, imagination, and patience in the pursuit of one's research materials, the fundamental question in evaluating a guide to a library's collection remains: is the published catalogue a worthwhile bibliographical contribution and a helpful reference work? For this book the answer is a definite yes. Scholars, librarians, and students can thank Rudolf Hirsch, the editor of this volume.

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ESSAY-REVIEW

DEWHURST, KENNETH. *Hughlings Jackson on Psychiatry*. Oxford: Sandford Publications, 1982. 178 pages. Price £ 9.00.

Reviewed by STEWART WOLF

THE author, Professor of Psychiatry at the University of the West Indies in Kingston, Jamaica, has written an engaging discussion of Jackson, his work, and his influence on psychiatrists and neurologists and on our still primitive but now rapidly evolving understanding of mind and brain. The book is scholarly without being dry or over-documented. The valuable bibliography contains references to nearly 50 of Jackson's papers, several of which were published in obscure journals. Numerous biographical notes and critiques of Jackson's work are cited also.

Jackson is best known for studies of epilepsy that yielded the first clear formulation of the nature of seizures. In epilepsy, as in other conditions, he based far-reaching neuroanatomical and physiological principles on the meticulous study of patients. He was particularly intrigued with the dreamy states, hallucinations of smell and taste, automatisms, and occasional violent behavior associated with some seizures that he correctly assigned to the temporal lobe. From this work he evolved a concept of hierarchical organization of the nervous system whereby control by the lower structures, cord, medulla, and pons is subordinate to the mid-zone of the nervous system that extends from the pons to the region of the Rolandic fissure which, in turn, is subject to the higher influences of the prefrontal area. Jackson held that nervous diseases, reversing this orderly evolutionary process, resulted in "dissolution" of functions. He further included manifestations of psychosis in this scheme and suggested that, in the presence of disease, withdrawal of normal control by the higher cerebral functions allows the emergence of "negative" symptoms such as altered consciousness and "positive" symptoms in the form of behavioral disorders.

Jackson proposed his theory of evolution and dissolution of the nervous system in his Croonian lectures in 1884 although he had addressed the mind–brain problem in earlier publications. Despite his having clearly described psychological manifestations as a consequence

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of disturbed circuitry, he was reluctant to mix psychological and physiological terms. "There is no physiology of the mind any more than there is a psychology of the nervous system," he wrote. Instead he insisted that the materialistic study of the nervous system would be impaired by a concern with psychology. Jackson held the confusing and rather paradoxical position that states of mind are utterly different from nervous states but that for every mental state there is a correlated but not interacting nervous state. He thus considered that neural and psychological phenomena occurred in parallel. The idea of parallelism is recognizable in the writings of Freud and Sherrington but was attacked vigorously by many of Jackson's contemporaries, including Morton Prince. The controversy, however, may have contained more semantics than substance. Angel in 1961 attempted a reconciliation by a small change in Jackson's use of words: "Every kind of mental process is correlated with a specific *kind* of cerebral process.[1]

It may be that Angel's compromise correctly reflected Jackson's thinking. Jackson, after all, had had a very limited general education and wrote poorly. His use of the term *parallel* to explain the relation between psychological and physiological phenomena ignores the connection which he clearly implies in his statement, "Negative and positive mental symptoms are for us, only signs of what is not going on, or is going on wrong in the highest sensorimotor centres." Further, as Dewhurst points out, Jackson considered that "motor and sensory centres of the highest level represent the 'organ of the mind,' or the anatomical substrata of consciousness." In his concept of consciousness, Jackson included memory, attention, emotional control, judgment, and will and, as Denis Williams, quoted by Dewhurst, pointed out, Jackson believed that consciousness represents the whole person mentally while its anatomical sensorimotor substrate represents the whole person physically. Apparent contradictions and conflicts of ideas may therefore result from differences in the use and interpretation of words. Had Jackson chosen the words *organization* and *integration* instead of *hierarchy* and *parallel* it would be easier to reconcile the apparent discrepancies in some of his own ideas. What could more clearly attest to the appropriateness of the words *organization* and *integration* to Jackson's theory of mentation than his own explanation of a person in revery seeing faces in

1. R. W. Angel, "Jackson, Freud and Sherrington on the Relation of Brain and Mind," *American Journal of Psychiatry* 118 (1961): 193–97.

the fire: "we do not see the cracks and marks in the burning coals. The cracks and marks do not produce the images of cracks and marks in us, they produce faces in us."

Irrespective of semantic difficulties, Jackson's concept that psychopathological manifestations are based on an underlying anatomicophysiological substrate that involves a release mechanism was not only original but powerfully heuristic. It sparked Freud's notion of regression and was built upon by Mazurkiewicz, Pierre Janet, and other leaders of European psychiatry as well as by Adolf Meyer in America.

In 1935 Russell Brain paid tribute to Jackson's conceptual powers as follows: "The discoverer of a substantial thing, such as a bacillus, an extract or a disease, achieves more certain immortality than one who discovers a principle, for permanently valid principles soon become part of current thought and in time appear so obvious as to have needed no discovery."[2] Adam Sulkowski, in a recent essay, *Psychobiology of Schizophrenia*, finds in the work of Jackson important but widely neglected explanatory power.[3] "From the selective overview of recent developments in neuropsychiatry and related fields of the neurosciences," he writes, "it will become apparent that [Jackson's] theory of evolution–dissolution of the central nervous system provides an attractive framework for reconciliation of seemingly contradictory points of view." Thus, Dewhurst's book is important not only to those who are interested in Hughlings Jackson but to all who are interested in the development of thought in psychiatry.

Jackson's influence extended to areas of philosophic thought in which the concept of neural organization dependent upon but distinct from anatomical structure had special appeal. In his McNair lecture (1950) Edmond Simmot quoted Lillie on the subject: "in living organisms physical integration and psychical integration represent two aspects . . . of one and the same fundamental biological process."[4] The phenomenon of organization, where the whole is greater than the sum of its parts, may thus give a clue to the puzzling relation between mind and the neuronal

2. W. R. Brain, cited by W. G. Lennox in *The Founders of Neurology*, ed. W. Haymaker, (Springfield, Ill.: Charles C. Thomas, 1953), p. 308.

3. A. Sulkowski, "Psychobiology of Schizophrenia. A Neo-Jacksonian Detour," *Perspectives in Biology and Medicine* 26 (1983): 205–18.

4. E. W. Sinnott, *Cell and Psyche. The Biology of Purpose* (Chapel Hill: University of North Carolina Press, 1950), p. 46.

circuitry of the brain. "Organization," said Needham, "and energy are the two fundamental problems which all science has to solve."[5] L. J. Henderson, the biochemist, held a similar view: "I believe that organization has finally become a category which stands beside those of matter and energy."[6] Sinnott adds his own thesis: "Biological organization (concerned with organic development and physiological activity) and psychical activity (concerned with behavior and thus leading to mind) are fundamentally the same thing."

Many thinkers had wrestled with the issues of mind and brain long before Jackson. Gassendi[7] and John Locke[8] had proposed that mental activities generated by the circuitry of the frontal lobes of the brain required activation by the inward traffic of sensory experience. One hundred years later the idea was carried forward and further supported by the French physiologist, Pierre Jean George Cabanis.[9] It was refined in this century by Norbert Wiener[10] and Warren McCulloch,[11] who outlined the architecture of the nervous system's organization in terms of complete, interacting afferent and efferent excitatory and inhibitory neuronal circuits. If his confusing language is correctly interpreted in Dewhurst's book, Hughlings Jackson's understanding of neural circuitry one hundred years ago may have led logically to that of present day neuroscientists who are able to begin to put the integrated view of mind and brain to experimental test.

In any case *Hughlings Jackson on Psychiatry* will be welcomed, not only by psychiatrists but by medical historians, physiologists, and all who have an interest in the brain and what it does.

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5. J. S. Needham, "Time: The Refreshing River," *Essays and Addresses, 1932–42* (New York: Macmillan Co., 1943).

6. L. J. Henderson, *The Order of Nature* (Cambridge: Harvard University Press, 1917), p. 230.

7. P. Gassendi, *Institutio Logica et Philosolphiae Epicuri Syntagma*, (London: R. Daniel, 1660).

8. J. Locke, *An Essay Concerning Human Understanding* 4 vols. (London, 1690).

9. P. J. G. Cabanis, *On the Relations Between the Physical and Moral Aspects of Man*, ed. G. Mora, trans. M. D. Saidi, (Baltimore: Johns Hopkins University Press, 1981).

10. N. Weiner, *Cybernetics on Control and Communications in the Animal and the Machine* (New York: John Wiley, 1948).

11. W. McCulloch, introductory discussion in *Cybernetics*, ed. H. von Foerster, (New York: Josiah Macy Jr. Foundation, 1950).

ESSAY-REVIEW

MORANTZ, REGINA MARKELL; CYNTHIA STODOLA POMERLEAU; and CAROL HANSEN FENICHEL; eds. *In Her Own Words: Oral Histories of Women Physicians.* Westport, Ct.: Greenwood, 1982. xiv & 284 pages, illustrated. Price $29.95.

Reviewed by JOHN B. BLAKE

THIS volume consists essentially in edited interviews with nine women physicians about their lives and careers. It is preceded by a general historical essay on women in medicine in America and includes brief discussions of the interviews. The arrangement of the interviews is chronological by ages of the persons interviewed, ranging from Katharine Sturgis, born in 1903, to Vanessa Gamble, 50 years her junior and still a medical student at the time of the interview.

The various interviews originated in an Oral History Project on Women in Medicine undertaken at the Medical College of Pennsylvania beginning in 1976. Some 40 women physicians were interviewed for periods ranging from 3 to 7 hours, mostly by Regina Morantz, a professional historian, one of the editors, and the author of the introductory historical essay. The original interviews were based on a questionnaire developed in advance, so that there is a basic consistency of structure and subjects covered in nearly all the interviews underlying the marked variation in detail that one would expect in the life histories of 40 strong-minded individualists. Unlike written questionnaires, however, the oral history technique allows the interviewer to explore unexpected areas of discussion as the progress of the interview may open them up. The original interviews were tape-recorded, transcribed, and, presumably, edited and approved by the subjects before being set down in final form. The transcriptions were deposited along with the tapes in the special collection on women in medicine at the library of the Medical College of Pennsylvania. Copies of the final transcriptions (except for three that were restricted) have also been deposited in six other libraries from Massachusetts to California, including the National Library of Medicine, where they may be examined by scholars. It is clear that the project was worked out carefully and was carried to its conclusion in a thoroughly professional manner.

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An examination of the full transcripts and also of the collective index to the interviews makes it clear what at least some of the planned questions were. They were intended to bring out rather full accounts of family background, childhood, and education. Marriage—the experience for those who were and the why not for the much smaller number who were not—and its relationship to the individuals' careers was a universal subject of inquiry, as were the subjects' careers, discrimination, feminism, the American Medical Women's Association, and a number of more general topics. Virtually all were apparently asked, for example, about the malpractice situation and whether it was exacerbated by the failure of self-policing among doctors, and whether women might be more receptive to socialized medicine because they were under less pressure to make money. The questionnaire, according to the preface to the volume under review, was also designed to elicit responses on matters relating to female health.

The interviewers were most successful in getting responses to the questions related to personal experience. The interviews tend to be comparatively full in discussions of family background, childhood, education, and career. More general areas of inquiry were on the whole less successful. Responses tended to be expressed again in terms related to the subjects' personal experience: anecdotes and incidents known to them were reported, rather than general analysis. This is no doubt to be expected in the circumstances of a personal interview, for analysis requires a degree of study and reflection for which the oral history technique provides little opportunity. The question on malpractice, for example, often elicited strong responses; it was a problem about which many of the respondents evidently had very decided opinions. Many of them saw it as a serious problem in the practice of medicine because of the jeopardy in which they were placed and the various defensive measures that they had to undertake. On the other hand, the interviewer's suggestion that lack of self-policing might be a major cause usually received at most perfunctory acknowledgment. The answers, in other words, tended to revolve about how the malpractice problem affected them or others they knew, as physicians, and their practice, rather then offering an analysis of causes. This is not to say that the answers had no significance. As anecdotal evidence they sometimes show a depth of feeling and a type of response that suggests the importance of the problem and attitudes that outside analysts must take into account.

Interestingly, the question on "socialized medicine" tended to evoke less emotional responses, with a few exceptions. These generally were based on reactions against interference with the physician's independence of judgment in treating patients, plus the burden of filling out forms—objections to bureaucratic controls, whether from government or insurance companies, rather than financial ones.

These observations are based largely on what may be found in the transcripts, including a number that are not in the book, and it is important to consider how the two differ. Most obvious, of course, is that the book includes only 9 out of approximately 40 interviews. The editors have attempted to choose ones that would give a sense of the diversity of women's experiences in medicine, and in this have succeeded quite well. Certainly they have not chosen just those that provide the most exciting copy or that conform to one point of view. The interviews are also abridged and to some degree rearranged, which makes for somewhat smoother reading. At the same time the editors have managed to retain the spontaneity and informality of the interviews and to represent the women's answers fairly and with only occasional minor changes from the words of the transcript.

The interviewer's questions have also been omitted "in the interest of concision and fluency" (p. xii). Because of the editing that the interviews received this may have been necessary. It does, however, eliminate some of the context in which the replies are framed, which may be an important dimension in an interview. It makes it more difficult for the reader to detect a questioner's bias, as in the question about "socialized medicine." It seems quite clear that Morantz attributes opposition to "socialized medicine" (which is not defined) to the desire of physicians, especially men, to maximize their incomes. Interestingly one respondent, Pauline Stitt, picked this up in her reply, noting that the question itself was biased by the idea that the money-making incentive was the deterrent (transcript, p. 95). (It is also biased, one may note, by the assumption that women are under less pressure to make money, a point that Stitt does not mention. This seems a curious assumption for a feminist, in view of the long-standing and well-justified complaint of women that they tend to be paid less because, in the opinion of some men, as either secondary earners in a family or as single persons they need less. Marjorie Wilson's reaction to encountering this attitude at a job interview [p. 190] is a case in point.) None of this comes out in the edited interview, however; indeed, although the term

"socialized medicine" appears in the index to the transcripts for five of the six older respondents, it appears in the index to the book for only one, Alma Dea Morani. It is my impression generally that the persons interviewed, whether noting the bias in Morantz's question or not, did not accept it, but rather perceived the problem as primarily one of independence, and several of the published interviews note with some dismay the increase in governmental and other controls. Issues related to medical economics—health insurance, Medicare and Medicaid, health maintenance organizations—other than the standard question on "socialized medicine" are sparsely represented in the transcripts; "charity" and "altruism" do not appear in the general index at all.

Probably this is not surprising, for it is these physicians' experience as *women* physicians that is of primary concern to the project managers. Their viewpoint, or at least that of Morantz, who did most of the interviews and wrote the historical introduction, is clearly conditioned by the current feminist movement. The historical introduction places heavy reliance on recent feminist history, and the reader who is not up on the latest ideological interpretations may have some problems in following the argument, especially as it relates to the nineteenth century. Surprisingly this does not seem to include the fact that some women had to work to earn a living or may have wanted to work to earn money, and being a doctor was better than being a teacher or seamstress. Male opposition, however, is attributed first of all to the fear of economic competition; and male physicians' arguments, is the implication, are mere rhetoric and rationalization to justify prejudice. In discussing the period of medical reform in the first three decades of this century, Morantz in general identifies herself with recent social historians who see medicine as an instrument of social control and who see medical reform—if not a capitalist plot—as at least ideologically linked with "the dominant industrial classes and the specific interest of a capitalistic corporate state" (p. 24, citing first E. Richard Brown's *Rockefeller Medicine Men*). In her version the pressure for reform from within the profession was less significant than that of the Rockefeller and Carnegie foundations to force changes from without. Somehow it is easier to see selfish economic motives in the actions of "them" than in "us."

In the interviews the special difficulties and discrimination that women have unquestionably encountered are well brought out. This obviously was one of the interviewer's objectives, and the collection provides a valuable body of illustrative evidence. It remains, however, personal rather than analytical, and as with other general questions

those related to women in medicine or the women's liberation movement, except as they related to the individual, tend to be less successful in eliciting interesting commentary than those relating to personal experience. This is not to be deplored. One of the particular values of the collection as a whole and of the book is the diversity of response, which may make it more difficult for historians today to project back upon women of an earlier period their own present attitudes about the role of women in professions and in society generally. Even so, the introduction seems more monolithic in its description of attitudes than the impression one gains from reading the experiences of these very individual women. The interviewer does not always get the answers that, despite her stated desire for objectivity, she appears to want or expect. Thus in the introduction to the transcript of the interview with Louise De Schweinitz, the oldest of the physicians interviewed but not selected for the book, the editor writes that although De Schweinitz failed to make full use of her medical education, having placed her husband's career and the needs of five children first, she "stubbornly refuses to agonize over what might have been" (transcript, p. 111)—despite, one must assume, the interviewer's efforts to have her do so.

In concluding the preface, the editors write, "If the general reader finds inspiration herein and the researcher a rich body of source material, we shall have accomplished what we set out to do." Medical historians will find useful information in the book, but the serious researcher should, if possible, go beyond it to the original collection of interviews, for he or she will find there an even richer body of source material unaffected by the additional editing necessary to prepare it for publication. Whether other readers will find inspiration is a question that each must answer for her or himself. One can well believe that these human stories of success despite opposition and adversity matter-of-factly told should prove to be more inspiring for young women contemplating a career in medicine than some of the soapy biographies written to inspire them. Every reader, however, can find interesting accounts of the lives of nine able, determined women of very diverse backgrounds, personalities, and careers within medicine. If nothing else, these accounts should help to put readers on guard against stereotypical thinking about women—or men—physicians. Whether they will is another question.

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ESSAY-REVIEW

MILES, WYNDHAM D. *A History of the National Library of Medicine.* Bethesda, Md.: National Library of Medicine, 1982. 531 pages. Price $14.00.

Reviewed by ANTHONY R. AGUIRRE

THE task of reviewing this book was approached with mixed feelings since for a librarian whose primary interest is the Library of the College of Physicians, immersion in the history of the National Library of Medicine seemed a distraction.

However, upon becoming involved with Miles's excellent volume it soon became apparent that here was not only a fascinating look at the historical development of policies which affect all contemporary medical libraries but also, in a very real sense, a history of some of the early years of the College of Physicians Library.

Miles has given us a masterful work. This is not a dry listing of names, statistics, and events, although these are recorded. It is a sweeping panorama of one hundred and sixty two years in the development of a great library and the lives of those who worked in it. The cast of characters comes alive and we sense their motivations, frustrations, and commitment to the bibliographic record they were leaving behind. The work is enlivened by numerous interesting touches. We learn how some of the delightful idiosyncracies of the *Index-Catalogue* came to be; we read of pigeons roosting on the card catalogue and bats perching on an employee's shoulder in the old building.

Most important, however, a reading of this chronicle serves as a reminder, in particular to those of us who have come of age professionally since the enactment of the Medical Library Assistance Act, that the mission of the Library is to serve the physician and not other libraries or librarians, and that, whether we like this concept or not, we are only links in the information transfer chain that extends from the Library to the physician and researcher.

The history of the Library as described by Miles divides into four periods. The first begins with the establishment of the Library as a few shelves of books in the office of Surgeon General Lowell and ends with the retirement of John Shaw Billings. This was the time of the phenomenal collection-building effort by Billings which followed

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transfer of the Library into Ford's theatre. The master librarian not only had a network of agents in European countries but also made arrangements with other government agencies to receive copies of reports and other records. Their efforts are described in chapters 4 and 5 of the book, entitled "The Great Journal Hunt" and "Gathering Books and Other Literature for the National Medical Library." The supreme achievement of these years, and the factor which made the Library world-renowned, was the creation of the *Index-Catalogue*. The development of this monumental work is lovingly detailed in Miles's book. Billings himself devoted many hours to indexing; shipments of journals were sent to army personnel throughout the country for indexing. One is fascinated by the thought of army surgeons in posts on the American frontier indexing journal articles, perhaps between treating casualties of Indian raids.

The *Index-Catalogue* is the unifying thread that stretches through the history of the Library, from the publication of the *Specimen Fasciculus* in 1876 by Billings to demonstrate his plan of indexing, to the closing of the series by Director Frank B. Rogers in 1955. It can be seen how a project which was the means to ease of access to the contents of the collection became an end in itself. In the 1880s half of the clerks employed at the Library were involved in the production of the *Index-Catalogue*. Continuation of the *Catalogue* was a subject of discussion among the Library staff, but outside opinion continued to demand it, and it was only the inability to keep up with the increase in medical information that decreed its end.

Other significant events of this period, which saw the Library become the largest medical library in the United States, were the publication of bibliographies in subjects of military interest, i.e., cholera, yellow fever, and military surgery; the beginnings of *Index Medicus*; the move to a new building on the Mall; and the appointments of Robert Fletcher as principal assistant librarian and Fielding Garrison as clerk.

The second period in the Library's history covers the years from 1895, when Billings retired, to 1936, when the then Librarian Edgar Hume decided to celebrate the 100th anniversary of the Library. At the beginning of this period, which consolidated the Library's achievements, the post of Librarian was treated as any other in the Medical department. Four officers served between 1895 and 1913. The longest term was served by Walter Drew McCaw, notable for scholarship and for his sponsorship of Fielding Garrison.

The years from 1876 to 1917 were those of assistant librarians, in which the achievements of Robert Fletcher and Fielding Garrison were manifest.

Fletcher is well known for assisting Billings in editing part of the first series of *Index-Catalogue* and then editing the second series himself. He co-edited the first series of *Index Medicus* and edited the second series with Garrison. He taught, wrote articles, and presided over the Philosophical Society of Washington.

Fielding Garrison succeeded Fletcher as editor of *Index Medicus* and then served as Principal Assistant Librarian in 1912. This year also saw the publication of Garrison's "Texts Illustrating the History of Medicine . . ." which later became Garrison and Morton's *Medical Bibliography*. A year later Garrison published the famous *Introduction to the History of Medicine*.

The ensuing years are described in chapters 12 through 15. The fluctuating fortunes of *Index Medicus* ending with its merger with the *Quarterly Cumulative Index*; the first of many attempts to merge the Library with the Library of Congress; lack of space and the push for a new building; shortages of trained personnel—all factors which culminate in a Library, in the late thirties, which was crowded and run down but on the verge of modernization.

From the time of Harold Wellington Jones's accession to the post of Librarian in 1939 to the end of Frank Bradway Rogers's term in 1963, the Library and its products were transformed completely. The introduction of microfilming and the publication of its most visible product, the *Current List of Medical Literature* under the leadership of Atherton Seidell, marked the beginning of the Library's involvement with new technologies as aids to medical bibliography.

A survey of the library by a team of librarians under the sponsorship of the American Library Association provided the impetus for complete reorganization of the internal operations. Notable results over the years were a complete overhaul of the card catalogue, the introduction of a new classification system, the establishment of Medical Subject Headings, and the end of the *Index-Catalogue*. The increasing backlog of unpublished citations, which reached 2 million by 1951, the possibility of developing a new index from the *Current List*, and the recommendations of various study groups persuaded Director Rogers to close the *Index-Catalogue* with the Mh-Mn volume of the fourth series. (A short supplementary Fifth Series, containing three thin volumes, was issued in 1959–61.)

The letter of transmittal from Director Rogers to the Surgeon General which prefaces the final volume of the Fourth Series details the history of the *Index-Catalogue* and the reasons for its end. It is a letter which mixes sorrow with pride of accomplishment and is an appropriate memorial for a magnificent achievement. If the closing of the *Index-Catalogue* represents the end of an era, it also represents the beginning of a new one. The creation of MEDLARS has had a profound influence on libraries in general. Although developed as a means of producing the publications of the Library, MEDLARS (Medical Literature Analysis and Retrieval System) has become the standard against which all bibliographic information retrieval systems are compared. It is the crowning achievement of the Rogers years at the Library.

During the "modern" era, described in the final chapters of the book, the Library under the directorship of Martin Cummings has embarked upon an extraordinary expansion of its activities. These years have given it the "new" *Index Medicus*, the rapid development of MEDLARS, Medline, the Toxicology Information Program, and the Regional Medical Library System with the subsequent transformation of American and to some extent foreign medical libraries, and the establishment of the National Library of Medicine as an important research institution.

The story portrayed in this volume ends in 1980 with the dedication of the Lister Hill Center for Biomedical Communications, but the exciting developments continue. At the time of this writing, Director Cummings has announced his retirement. During his tenure the Regional Medical Library Program has, in a sense, achieved its goals. A national network has been established, librarians have been trained, collections have been expanded and libraries built, and a vast number of physicians is receiving medical information services quickly and efficiently. Medical librarians can take pride in the fact that the RML program is an increasingly recognized model for academic and public library networking and that the achievements of the National Library of Medicine in library automation have laid the foundation for all other developments in this area. The NLM is now, as a result of the Matheson report,[1] embarking

1. N. W. Matheson and J. A. Cooper, "Academic intormation in the academic health sciences center. Roles for the library in information management," *Journal of Medical Education* 57 (1982): 1–93.

upon the investigation of library-based integrated information systems in academic medical centers. This will continue a series of remarkable achievements in the tradition of a remarkable library.

In more mundane terms, the book is provided, as might be expected, with an excellent index and several appendices. These include a list of members of past and present Boards of Regents, a useful chronology of important events in the history of the Library, keyed to the appropriate pages in the text, statistics, and a list of awards to members of the Library staff. Each chapter is thoroughly documented.

In summary, Wyndham Miles has not only made a valuable contribution to the history of medical librarianship, he has also given us a thoroughly interesting and enjoyable book. This is a volume which heartens those of us who are convinced that the older bibliographies and traditional methods of bibliographic searching are still needed and in demand, and a volume which may serve to impress upon younger librarians, fascinated with automated searching and computerized libraries, that medical bibliography did not begin in 1965.

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MARY D. AMES, M.D.
1913–1983

Jean A. Cortner, M.D.

DOCTOR MARY D. AMES, senior pediatrician at The Children's Hospital of Philadelphia and professor of pediatrics at the University of Pennsylvania, died on April 21, 1983, at the Hospital of the University of Pennsylvania. She would have been 70 in May.

Born in Columbia, Tennessee, Dr. Ames received her Bachelor of Arts Degree from Agnes Scott College in Georgia, her medical degree from the University of Texas Medical Branch in Galveston, an honorary Master's Degree from the University of Pennsylvania, and an honorary Doctorate of Science from Dickinson College in Carlisle, Pennsylvania, where she was a member of the Board of Trustees.

Dr. Ames served her pediatric residency at the Children's Hospital of Michigan and became an Instructor in Pediatrics at Wayne State University in Detroit. She then became an instructor in pediatrics at New York University's School of Medicine during her term as chief pediatric resident physician at Bellevue Hospital in that city.

Prior to her move to Philadelphia, Dr. Ames was chief of the pediatric department at Polyclinic Hospital in Harrisburg, where she was also coordinator of the pediatric residency program. While there she also directed the Pennsylvania State Seizure Clinic and the Children's Diagnostic Center, Inc. and served as a consultant to the State Hospital for Crippled Children in Elizabethtown, Pennsylvania.

Dr. Ames was the liaison officer between Philadelphia Children's Hospital and the American Research Hospital for Children in Krakow, Poland, and consultant at the Institute for Mother and Child in Warsaw, Poland. She received the Annual Heart Award from the Variety Club, in 1971, and the Annual Award of the League of Children's Hospital in 1972. At that time she also served on the Board of Trustees of the Southern Home for Children. She was active in many medical societies.

She has been at the Children's Hospital of Philadelphia since 1962 and served as Director of the Division of Rehabilitation until three years ago. In the mid-1960s, Dr. Ames developed one of the nation's first multispecialty clinics for children suffering from multiple disabilities.

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She emphasized long-term care involving all of the appropriate disciplines and often said that children born with multiple disabilities were "children with problems, not problem children." Under her direction and guidance the Rehabilitation Division at the Children's Hospital of Philadelphia became a regional resource and also gained international recognition.

During the last three years she utilized her extraordinary administrative skills as Administrator of the Ambulatory Services at the Children's Hospital of Philadelphia. She is greatly missed by her colleagues and friends at Children's Hospital of Philadelphia.

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